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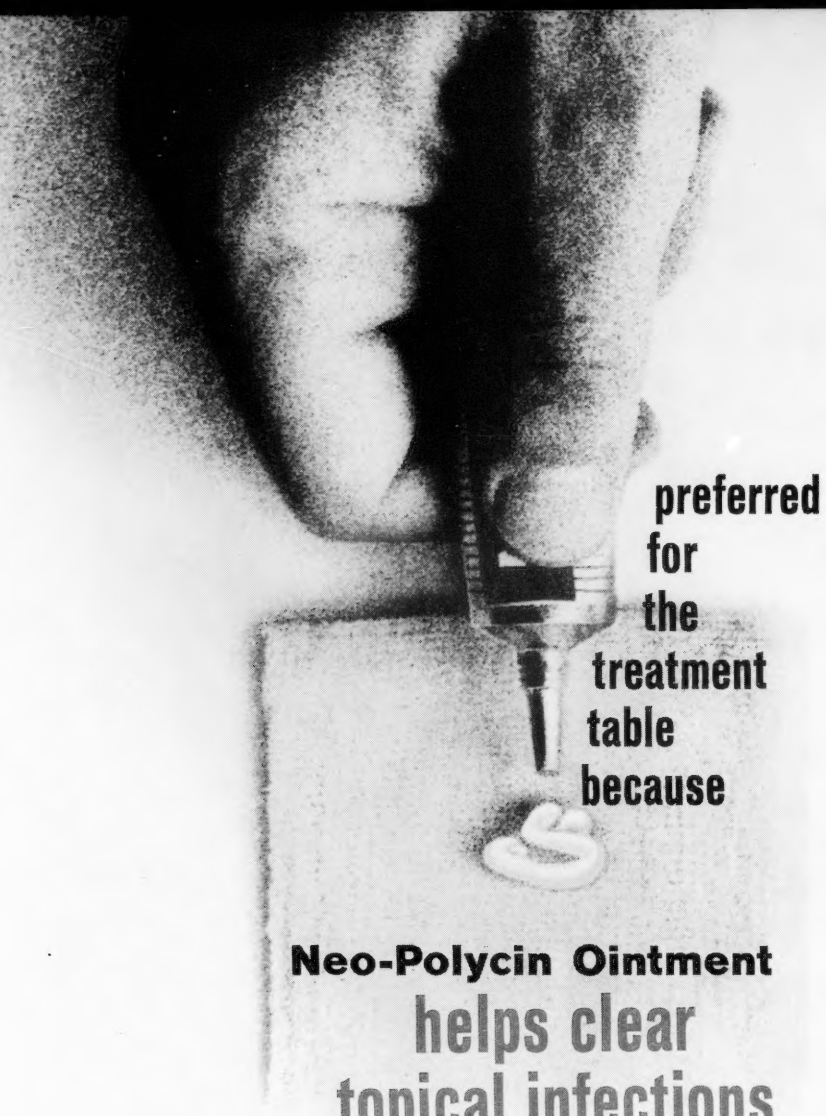

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The Industrial Medical Association was organized in 1915 as the American Association of Industrial Physicians and Surgeons. Its first annual meeting was held the following year. In 1951 the present name was adopted.

The purposes of the organization as stated in the certificate of incorporation (not-for-profit) are:

"The object of this Association will be to foster the study and discussion of the problems peculiar to industrial medicine and surgery; to develop methods adapted to the conservation of health among workers in the industries; to promote a more general understanding of the purposes of the medical care for employees; and to unite into one organization members of the medical profession specializing in industrial medicine and surgery for their mutual advancement in the practice of their profession."

Presently, the membership includes more than 4000 physicians in the United States, Canada, Latin America, and other parts of the world. Physicians "who have an interest in Industrial Medicine" may apply for membership; specialization in this field is not essential. Regionally, the Industrial Medicine Association has 15 Component Societies in the United States. The majority of the Association's members carry their memberships through one of the component groups.

The Journal of Occupational Medicine, owned and published by the Industrial Medical Association, is sent monthly to each member as one of the advantages of membership.

The annual business meeting and convention is held in the spring. Since 1945, the convention has been held concurrently with the meetings of other organizations having related interests including the American Association of Industrial Nurses, Inc., and the American Association of Industrial Dentists. This combination of meetings is known as the Industrial Health Conference.

The Occupational Health Institute, Inc., is a non-profit educational organization created by the Industrial Medical Association to promote the cause of health in industry. Since 1951, the Occupational Health Institute has conducted the program of evaluation, approval and certification of Medical Services in Industry, on the basis of standards established by the Standards Committee of the Industrial Medical Association. This program was conducted by the American College of Surgeons for many years until its transfer to the Association.

The Association's headquarters office serves as a focal point for the Association's activities and through its coordination of information regarding industrial health problems encountered throughout the country, it offers invaluable assistance to members on a host of specific subjects.

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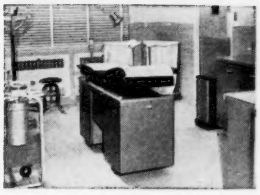

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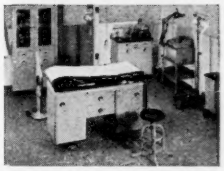

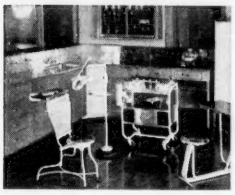

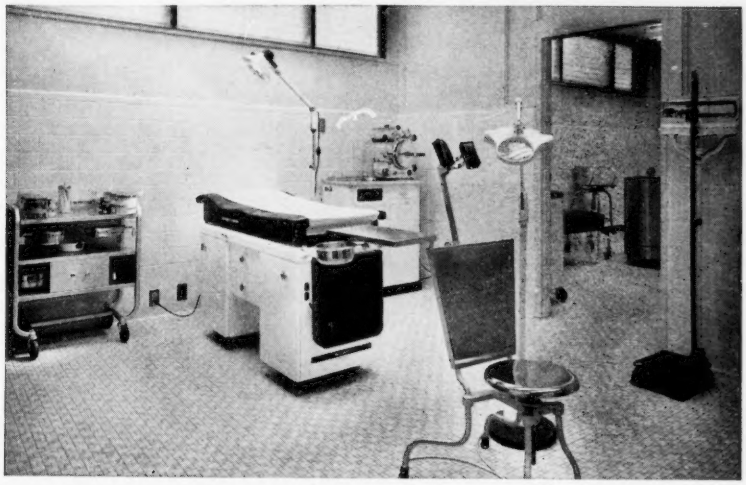

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Through its District Counselors, the Industrial Medical Association is represented regionally throughout the United States and Canada. Each district is served by a Counselor appointed by the President of the Association. The District Counselor reflects the attitude of the membership of his district in his relations with the national organization, and in turn, reports and interprets policies of the Association to the membership and the general public in his district.

An important function of the District Counselor is to serve in a liaison capacity with the Component Society of the Industrial Medical Association in his area. The District Counselor also is concerned with regional trends in industrial medical practice and in legislation bearing upon medical service in industry. He is ready to assist any physician with questions or problems.

In promoting the cause of industrial medicine, many District Counselors work with the industrial health committees of their state medical societies, they participate in teaching programs at hospitals or medical schools, and serve as speakers at meetings of groups that express interest in occupational health. Throughout these activities, the District Counselor attempts to stimulate membership in the Industrial Medical Association by acquainting others with the organization's purposes and facilities.

By keeping in close contact with members in his area, the District Counselor gains a familiarity with their work which enables him to make recommendations to the Association's officers and committees regarding those qualified for various positions or honors. He recommends members for committee work, and for fellowship, and recommends fellows for consideration for elective offices in the Association. He also recommends possible recipients for the awards presented at the annual meeting of the Association—the Knudsen Award, the Health Achievement in Industry Award, the Meritorious Service Award and the Merit in Authorship Award.

Many District Counselors also serve as Regional Consultants for the Occupational Health Institute, the educational affiliate of the IMA.

Journal of Occupational Medicine

The Doctor's Role in Workmen's Compensation

Douglass A. Campbell, A.B., M.S., J.D., Los Angeles, Calif.

1. Introduction

Practical necessity has brought the legal and medical professions into intimate contact in the administration of workmen's compensation. Every injury requires medical care to cure and relieve its effects and medical opinion in claim adjustment and resulting litigation. A large share of the premium dollar goes for medical and hospital treatment.

Of the difficulties arising from this association, some are traceable to problems of communication. Many doctors are unaware of what is required from them in compensation medicine. I hope to clarify the more obvious difficulties.

2. Compensability of Disease

The language of a majority of the compensation acts in the United States requires that an "accident" occur within and because of the employment. In practical application, the courts have wiped out the early restrictive meaning of the term. Originally, it was applied only to an unexpected cause. It now describes a result unintended by the employee. "Injury" as used in this paper includes the broader connotation of accident. A quick scanning of the various Acts discloses that seven make specific provision for apportioning the effect of preexisting disease and superimposed compensable trauma.[1] Three of them apportion even for death.[2] Most Acts have provision for insulating employers from the effect of prior permanent partial disability in their subsequently injured employees. Several Acts have provision for waiver of liability for prior physical impairment.[3]

The extent to which disability or death due to disease is compensable varies, as does the test for a compensable event. While the extent of liability varies, so far as basic compensability is concerned, it is immaterial whether a compensable injury either caused a primary lesion or aggravated a preexisting disease. The test of liability is the effect of the accused event or exposure upon the employee, not what it would have been in a healthy person. Where preexisting pathology is asyptomatic prior to an injury which produces disability that would not exist without the injury, the entire result is compensable. It should be self-evident that disability or death due to the normal progression of a disease occurring in an employed person is not an injury and is not compensable.

3. Industrial Medicine

Much of the difficulty arises from the failure of the medical profession to recognize industrial medicine as a distinct specialty. The peculiarity of practice which justifies this classification is in the demands of forensic and literary medicine. "Forensic medicine" involves oral testimony of the doctor who is subjected to both direct and cross examination in court. "Literary medicine" refers to the reporting duty, which is such a characteristic part of industrial medicine.

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4. Importance of Medical Reports

Every compensation case is in potential litigation during the life of the continuing jurisdiction of the particular compensation agency. This makes it doubly important to have adequate recording and reporting by the doctor and his staff because memory unrecorded has little value. Doctors who practice industrial medicine assume a duty of paper work which is as important in determining the final cost of a case to the employer as is the nature of the injury itself.

To the claimsmen and attorneys in workmen's compensation cases, medical reports are what checks are to a bank—unless they be of proper form and content they are worthless. An inadequate report is doubly dangerous. It denies the evidentiary aid that the party offering it needs and leads that party into a false sense of security. Use of written reports speeds the adjustment and adjudication of our cases at a lower cost in time and money than would be required were the authors present to testify in person. A price is paid, however, for this simplicity. One may not be able to protect against an inadequate report by reinforcing oral testimony.

The doctor must frame his report having in mind rules of liability under the compensation act involved and scientific medicine. A report which merely states that a certain disease process preexisted injury is inadequate. It must state whether or not that lesion was producing symptoms; how often, if at all, and when it had earlier produced disability; of what that consisted, and whether injury in fact had aggravated the pathology either in the manner claimed by the patient or in some other manner disclosed by the examination. A bare recital of subjective complaints is worthless without stating when they are present, their degree, what the patient does, if anything, to obtain relief, and their effect upon the use of the part involved.*

"(a) A severe pain would preclude the activities precipitating the pain;

(b) A moderate pain could be tolerated but would cause marked handicap in the performance of the activity precipitating the pain;

(c) A slight pain could be tolerated but would cause some handicap in the performance of the activity producing the pain;

(d) A minimal (mild) pain would constitute an annoyance but cause no handicap in the performance of the particular activity, and would be considered as not ratable permanent disability."

5. Doctor's First Report of Work Injury

The report of work injury is mandatory as the first professional information concerning the merits and circumstances of the employee's claim. Very often it is important in determining credibility to know the date the claim was first reported and when the employee first went to the doctor after the injury. Equally important is the recording of the history of onset as nearly as possible in the words of the employee. At this first visit, he is an injured person and thoughts of compensation or litigation have not ordinarily yet arisen. An unslanted, truthful story is most likely then to be obtained, but it should not be garbled in the doctor's office.

Important material, too often omitted, is a complete listing of the parts of the body of which the employee is complaining, an identification of preexisting deformities or illnesses, and a concluding statement: "There were no other complaints." This should be included in both the office records and every report. Frequently, the employee will testify that he told the doctor or nurse about certain complaints, but the reports—and, worse still, the office records—are silent on these points. Every complaint should be listed in the records of each visit followed by the true statement: "There were no other complaints."

6. Progress Reports

In an early progress report, the doctor should indicate the probable duration of temporary disability, need for continued treatment, and whether or not permanent disability is likely to result and its probable extent. This not only allows the insurance carrier to set up its statutory reserves but permits its adjuster to identify a case requiring more than routine care.

Progress reports are also important in the early identification of aberrancy. If the case is not progressing normally to healing, if functional, psychosomatic, or subjective complaints appear inconsistent with the diagnosed disability, this should be reported promptly by the doctor so that it can be noted by the adjuster for special study. The longer the subjective complaints are permitted to exist without adequate handling the more likely they are to become permanent case features.

Routine progress reports have another im-

*An outstanding problem of semantics is represented by efforts to evaluate and describe degrees of subjective complaints. The California Industrial Accident Commission has sought to standardize evaluation by the following rule (California Administrative Code Title 8, Sec. 10927):

portant purpose. When a case has been reported progressively improving, there are reasonable grounds for investigation if, just before final description of permanent disability, there is marked retrogression. Possible "compensationitis" should be suspected. Special attention should be given to determine the validity and true cause of the worsening.

7. Specialist's Report

In determining the relationship of trauma to disability, certain fundamental questions must be answered:

1. What was the condition of the part of the body involved and of the body generally prior to the claimed injury?
2. How severe was the injury to the part of the body involved?
3. What type of injury occurred—crushing, penetrating, strain?
4. What symptoms were present at the time of the alleged injury and shortly thereafter, and when did they appear?
5. How many of the examination findings actually preexisted?
6. Was an underlying, preexisting lesion present, and if so, what? Was it aggravated? If so, to what extent?
7. If strain be accused, precisely what was being done at the time?
8. Was the activity normal or unusual for the patient?
9. Medically, what happened to the patient?
10. What extra-traumatic complications exist in the patient, and what are their effects?
11. Did autopsy show pathological changes corresponding with the clinical history of the patient and consistent with the time elapsing between claimed injury and death?

There may be conflicting opinions as to causation. Not only should the doctor state the cause adopted by him but why he rejects the other possible causes. The reasons given for the medical opinion are most important. The weight or value of the opinion depends upon the validity of the reasons assigned to it and the facts by which it is supported.

Another important result of this analysis of cause is the assistance it gives to the laymen evaluating reports. When multiple examiners report and, as too often occurs, each adopts a different cause, the laymen are left without a yardstick if the analysis suggested is not set forth.

It is an unfortunate fact that as soon as litigation enters the picture scientific procedures and attitudes become diluted by partisan enthusiasm, with the result that opinions as to the effect of an accused event upon a subsequent health condition are produced more for their economic value than for scientific worth. It is surprising how many ostensibly qualified medical experts express contrary opinions regarding factual situations. Possibly this is because they try to become attorneys and cease to be medical specialists.

I am convinced that if doctors carefully reviewed the various possible causes of the conditions found by them, considering each in turn on the basis of sound medical reasoning, we would have a higher average of scientific worth in our reports.

Summary

Paper work is a vital "complication" of industrial practice. Responsibility to both the patient and to the compensation insurance carrier for adequate reporting equals that for proper treatment. Both administration and litigation of workmen's compensation claims are conducted by, through, and before laymen. The problem of the reporting doctor is to so analyze the etiology of the entity diagnosed by him that applicable rules of law may be applied understandingly or his thinking intelligently compared with conflicting opinions.

Diagnosis without recital of appropriate history and identification of laboratory and other clinical aids is inadequate. When controversy exists not only as to diagnosis but also as to etiology and the effect of an accused event upon the patient's health, discursive explanation is important.

Medical reports in Workmen's Compensation cases are like checks to a bank—unless in proper form and content they are worthless.

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References

1. Labor Codes of the following states: California, Sec. 4663; Connecticut, Sec. 31-139; Florida, Sec. 440.02 (19); Kansas, Sec. 44-5a01 (b); Kentucky, Sec. 352.005; Mississippi, Sec. 6998-04; North Dakota, Sec. 65-0515; Washington, Sec. 51.32.100.

2. Labor Codes of the following states: Connecticut, Sec. 31-139; Florida, Sec. 440.02 (19); Kentucky, Sec. 342.005.

3. Labor Codes of the following states: Connecticut, Sec. 7465; Iowa, Sec. 85.55; Kentucky, Sec. 2, Chap. 221, Laws 1259; Maryland, Sec. 51; Massachusetts, Sec. 46.

Medicolegal Problems and the Impartial Medical Witness

S. A. Levinson, M.D., Chicago, Ill.

THE FUNCTION of the forensic pathologist is to determine the cause of death due to casualty, violence, or undue means. He is also called upon to investigate sudden and unexpected deaths due to natural causes in patients who in previous weeks were not under a physician's care. The forensic pathologist may arrive at the cause of death by external examination of the dead body and any clinical history he can obtain from the family, friends, physician or police agencies. If he is unable to determine the cause on this basis, he must perform an autopsy. The forensic pathologist, in either the coroner's or the medical examiner's system must have available histologic and microbiologic as well as serologic aids, plus toxicologic assistance and, when indicated, the services of crime investigation laboratories.

It is clear that the forensic pathologist functions as a county or state official. If he is appointed as coroner's pathologist he represents an elected official; if he is pathologist in a medical examiner's office he represents a city, county, or state-appointed official. In any case he does not represent the plaintiff, the accused, or the state. In fact, his findings should be those of an impartial medical witness.

In addition to the discovery of cause, it is the function of the coroner's and medical examiner's office to determine how and by what means a person came to his death as a result of violence, casualty, or other undue means, if there is a reasonable suspicion thereof. Hence, this type of investigation takes place after the death of the individual.

Since the forensic pathologist is called upon to testify in civil, homicide, and criminal cases, what procedure should govern his conduct in the trial hearings? There is just one answer to this question, and it applies for every witness in the courtroom. The witness takes the oath to "tell the truth and nothing but the truth." But an expert physician witness is in a position quite distinct from that of most lay witnesses—he presents objective findings and subjective opinions.

As a rule, objective findings are not absolute, for they tend to be colored by some subjective impressions. The pathologist, however, must endeavor to minimize this through reliance upon objective observation in the external examination of the dead body as well as gross and histologic examination of tissues and body fluids. He can then testify as a witness of fact and report only on what he has observed.

When asked by counsel on either side for an opinion as to the cause of death, how and by what means, and a host of sundry questions including hypothetical ones, the physician-pathologist finds himself in a new domain. This requires an integration of preexisting observations and investigation, and the interpretation now becomes personal. Surely experience and study may season and mature one's interpretation of the findings, but the interpretation nevertheless is an opinion. If there are differences of opinion among pathologists with respect to the stated objective facts, what is the truth? How are the judge and jury to determine the truth?

As in most cases of scientific investigation, three types of conclusions are possible: a clearly positive, a clearly negative, and one which is somewhere between the two. The pathologist can state with reasonable certainty that the nature of the anatomic findings indicates a direct causal connection between injury, disease, and death. The opposite alternative is that he does not know or cannot demonstrate anatomic evidence for the cause of the death. To illustrate: A 56-year-old man employed as a

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brakeman in the railroad yards was accidentally struck on the left side of the chest by a metal bar. He collapsed, was taken to a hospital where he received immediate attention for his "shock" state, and was hospitalized. There were no external marks of trauma, and for the next 48 hours he was comfortable. He complained of severe pain in his chest and difficulty in breathing, and his skin became cyanotic. The hospital physicians were summoned, electrocardiographic changes and findings on physical examination indicated the presence of ventricular fibrillation. The patient died, and because of the history of trauma this case was referred to the coroner's office. On autopsy, including examination of the central nervous system, there was no gross or microscopic evidence that could explain death. The pathologist was unable to demonstrate by the usual and accepted procedures, changes in the myocardium to explain ventricular fibrillation. Because of a history of supposed trauma and a clinical diagnosis of ventricular fibrillation, the counsel for the plaintiff endeavored to show a causal connection between trauma and ventricular fibrillation.

The third type of conclusion is that in which there is some evidence of trauma with little or no anatomic change. In other words, the positive and negative overlap, presenting a gray coloration. An example of this is to be found in cases of subdural hemorrhage. Some of these hemorrhages are due to trauma: as in skull fracture with traumatic laceration of the brain, in contracoup hemorrhage without skull fracture, and in traumatic rupture of middle meningeal artery. Others result from nontraumatic causes, including infectious diseases of the brain, uremia, spontaneous intraventricular hemorrhage, and ruptured congenital aneurysm of the basilar artery.

An example of the problem is to be found in the case of a 42-year-old steel worker who, while engaged in a fight with a fellow employee, struck his head against a wall and collapsed. He was taken to the hospital, became comatose, and died. The coroner's pathologist observed bruises of the skin and ecchymosis beneath the occipital scalp. The essential autopsy findings were a ruptured aneurysm of the posterior inferior cerebellar artery, with hemorrhage in the basilar cisterns and subarachnoid space. The objective findings in this case were evidence of a fist fight, and the pathologic changes in the central nervous system. Was the subarachnoid hemorrhage spontaneous and secondary to the rupture of the congenital aneurysm of the basilar artery, or did trauma cause the rupture of the aneurysm? This is in the realm of opinion, based on experienced study. The proponents of trauma as the cause of hemorrhage and rupture of the aneurysm believe that if there is a degree of stress during an altercation or a fight or other situation beyond that experienced in the ordinary activities of his work, then there exists a causal connection between trauma and death. There are those who do not accept this explanation, but favor the nontraumatic cause and support their opinion by histologic sections of the dilated, thin-walled, ruptured aneurysm which ruptures under stress. The aneurysm was present before the fight and undue stress may have led to its rupture independently of trauma. Rupture of a basilar aneurysm may occur during rest and sleep. It is reasoned by this group of pathologists that physical injury to the head is very rarely the primary cause of fatal rupture of a congenital saccular aneurysm in the brain. Here is a point-counterpoint situation which can be resolved only by an opinion based on honesty and integrity of the witness.

Another example is that of a 25-year-old man employed in a stock room in a department store. While lifting some empty boxes, he experienced pain in his back, despite which he continued working. About two weeks later he consulted a physician, who was unable to diagnose the cause of the pain and the patient was referred to an orthopedic surgeon. A roentgenogram of the vertebrae was made, an abnormal shadow was seen, the patient was hospitalized, and an exploratory biopsy was performed. The pathologist reported a malignant tumor, probably a carcinoma, but was unable to determine whether this was a primary or a secondary tumor. The patient sued the department store on the basis that lifting an empty box produced injury to the vertebra with resulting tumor formation. The industrial commission ruled in favor of the plaintiff. A year later the patient was hospitalized again. There was evidence of paralysis, his clinical condition took a downhill course, various complications developed, and the patient died. Necropsy was not permitted.

This case was now referred to me for review. Since an autopsy was not permitted by the family the review was limited to the sections developed from the biopsy. These revealed a plasmacytoma. The defendant's attorneys accepted my interpretation that the tumor in the vertebra was primary and present for some time, not caused by lifting a box, and that there was therefore no causal connection between the reported event and the lesion. Despite this finding, the defendant's attorneys agreed to a

settlement with the plaintiff's attorneys, thus lending support to the earlier finding of the industrial commission.

Let us not lose sight of the fact that the adversaries for plaintiff and defense like to make the gray a darker gray by introducing irrelevant questions into the discussion, such as asking the witness if he is being paid for his testimony, thus to discredit the witness before the court and jury. The witness who, in his judgment, tells the truth should command equal respect from the lawyers in trial examination. The witness is paid for his time spent in court and in the study and preparation of the case and should never be paid for his testimony. If and when this does happen the lawyers share a burden of guilt in employing medical witnesses and compensating them for their testimony. This kind of medical witness and a lawyer are both strong arguments for the need of impartial medical testimony. It may not be out of order to comment that both the medical and legal professions should have remedies to care for those who have violated their respective oaths and trusts to society.

I have indicated previously that the general pathologist, either anatomic or clinical pathologist, or one who specializes in both branches, should be a good example of the impartial medical witness if for no other reason than that he has no position to defend with respect to earlier diagnosis and outcome of the case whose final outcome in under investigation. As a citizen and as a scientist he is expected to adhere to the truth and not to deviate from his judgment of the truth, irrespective of what side summons him as a witness. The role of the forensic pathologist should be one of an impartial witness. He is primarily a general pathologist, certified by the American Board of Pathology, with possible certification by the recently established subsidiary Board of Forensic Pathology. Since there are multiple disciplines in the forensic sciences, the forensic pathologist should adhere to his findings in his specialty and not presume to be an expert in the identification of poisons, ballistics, crime investigation, police sciences, or document examination. There are experts in these fields, just as the forensic pathologist is expert in his specialty.

Summary

It is exceedingly important that the forensic pathologist, a scientist in a highly disciplined area, present his findings and opinions as an impartial medical witness. He is an integral part of a public office. In this situation, he can serve neither the plaintiff nor the defendant; he can serve only the truth insofar as this can be determined from the objective evidence. When he does this he exhibits the highest ideals of the ethical practice in the forensic sciences.

(The author's address is University of Illinois Research and Educational Hospitals, 840 S. Wood St., Chicago 12, Ill.)

NORTHWEST ASSOCIATION OF OCCUPATIONAL MEDICINE

will hold its annual meeting

September 11, 1960

Hotel Multnomah, Portland, Oregon

This is a medical meeting oriented toward a lay audience of wide and diverse backgrounds and interests. The program will include a clinic on industrial dermatoses for nurses only to be conducted by Donald J. Birmingham, M.D., Medical Director and Chief Dermatologist, Occupational Health Field Headquarters, U.S. Public Health Service. The following presentations will also be featured on the program: "Etiology of Disease—Single Vs. Multiple Causation"—J. S. Tyhurst, M.D., Head, Department of Psychiatry, University of British Columbia; "Enzymes, Key to Cellular Existence"—W. R. Todd, Professor of Biochemistry, University of Oregon Medical School; "Heavy Metal Poisoning"—Charles McGill, M.D.; "Prelude to Litigation"—Herbert Schwab, Judge, Circuit Court of Oregon; "What Is Preventable?"—Norbert J. Roberts, M.D., Standard Oil Company (N.J.); "Troubled Breathing"—Donald Pitcairn, M.D., University of Oregon Medical School; "Pneumoconioses—Real and Rumored"—O. A. Sander, M.D., Consultant in Occupational Medicine; "Life Span Immunization"—H. L. Reed, M.D., Medical Department, Hercules Powder Co.; "Epoxy Resins and the Patch Test,"—Donald J. Birmingham, M.D.

The Diabetic IS Employable

Hugo T. Engelhardt, M.D., and Harvey B. Snyder, M.D., Houston, Texas

DIABETES mellitus is by no means a rare disease. It is estimated that almost 5,000,000 persons in the United States are either diabetics or potential diabetics. Almost 75% of these are more than 40 years of age. It is in this group that the experienced and skilled employees are found. Dr. Howard Root[1] has stressed the fact that this makes diabetes mellitus an important disease in industry.

In a study[2] of 500 persons chosen at random in a large industry, 2% were found to have definite evidence of the disease, while another 1.4% satisfied the criteria for potential diabetes. It is significant that the average age of those tested was 40 years.

In order to demonstrate the working experience of diabetics, we studied the office personnel of a large industry. We were able to discover 23 instances in which a definite history of diabetes could be determined. The average age of the subjects was 56.8 years, and the duration of their disease averaged 8.52 years. To determine the average number of days lost from work by these persons, their work histories for the last five years were investigated. Their average number of days absent because of sickness was 6.94 per year. This compares with the figure of 4.61 days per year for the nondiabetic office personnel and 6.97 days per year for the same company's entire working force over the same five-year period.

Because of the age of the subjects, a good many complications were observed. Table I illustrates these, together with the age of the subjects and the number of days absent during the last five years. As one would expect, the cardiovascular system was affected in a number of instances. Two of the subjects had coronary artery disease, exemplified by the anginal syndrome. Four of them had benign essential hypertension. Two subjects had evidence of peripheral vascular disease. Although gout is an uncommon complication of diabetes, it is of interest that two of the subjects suffered from a combination of these diseases.[3] The diabetes of one person was complicated by bronchial asthma. This, like gout, is infrequently seen in persons exhibiting diabetes mellitus. McDaniel[4] reports that, in a study of 16,016 true diabetics in the Joslin Clinic, bronchial asthma was observed in only 30 patients. One of the subjects, who has had diabetes mellitus for 10 years, has been absent from work 142 days over the past five years; it is significant that this case is complicated by alcoholism. Another subject in this

Table I—Data of Diabetics Studied

No.	Age	Length of Disease	Days Absent in Last Five Years	Complications
1	65	3	0	None
2	68	5	0	None
3	61	11	6	None
4	52	10	7	Coronary artery disease
5	46	18	19	None
6	62	11	15	Gout
7	56	10	142	Alcoholism
8	61	1	14	Benign essential hypertension
9	55	7	4	None
10	39	1	0	None
11	49	1	174	Alcoholism
12	65	10	146	Benign essential hypertension
13	48	5	21	Benign essential hypertension
14	51	1	0	None
15	65	30	3	Gout and diabetic neuropathy
16	45	1	3	None
17	61	10	2	Obese
18	59	10	56	Benign essential hypertension
19	61	10	10	Coronary artery disease
20	68	26	12	Mild early peripheral vascular disease
21	63	3	132	Bronchial asthma
22	45	1	21	Obese
23	61	11	12	Mild early peripheral vascular disease

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study, who was diagnosed as a diabetic a little more than a year ago, has been absent from work 174 days in the past five years; this case is also complicated by alcoholism. The absence of these two employees totals 316 days for the past five years, or more than 39% of the total absenteeism of the 23 subjects. There were two persons whose only abnormality was marked obesity, and six subjects were considered healthy.

In a study of employees in the oil industry, Weaver and Perret[5] found the average age of their subjects to be 52.7 years. The average duration of the disease was 8.6 years, and the average number of days absent for sickness was 9.8 per year. Our findings compared closely with these so far as age and duration of the disease were concerned. The average number of days absent for sickness was somewhat less in our study—namely, 6.94 per year. Perhaps this can be explained by the fact that the former survey dealt with a greater number of persons.

Also, our group was composed entirely of executives and white-collar workers, and, as a result, the accident experience was negligible. In their study, Weaver and Perret reported a disabling-injury rate of 15.6 per 1,000,000 hours of exposure compared to 12.9 for the nondiabetic group. They point out that these represented very few disabling injuries; hence, no great statistical value can be placed on them. Dublin and Marks[6] indicate that the accident experience of diabetic workers is a satisfactory one. Their figures reveal that the frequency rate was 7.8 per 10,000 exposure hours for nondisabling injuries among diabetics, whereas for a control group, it was 7.4. They suggest the possibility that the diabetic workers were more conscientious in reporting even minor disabilities because of their knowledge of the role which infection plays in diabetes, and this factor, the authors propose, might have influenced the reported rates.

It is of interest that all our subjects were working in an unrestricted capacity at the time of this study. A number of the group have since retired, and in no instance was the retirement on a disability basis. All of these people are under the care of their family physicians, with a little more than one-third requiring insulin in daily doses varying from 10 units of a long-acting insulin to 60 units of mixtures of protamine zinc and crystalline insulins. None has ever suffered hypoglycemia, nor has there been an instance of diabetic coma. It must be emphasized that the type of diabetes that these persons exhibit is of the adult variety, and they have responded very well to therapy.

Any physician in industry is aware of the discrimination which, rightly or wrongly, exists in the minds of those who are asked to hire a diabetic. This is illustrated by the experience of a 25-year-old man who recently graduated in the upper 10% of his law school class. He was in excellent health, as verified by the physician examining for the company with which he sought employment. The lawyer's history revealed that he was known to be diabetic for eight years, had never been in coma, and required 40 units of a long-acting insulin. He related to us that the physician told him the diabetes precluded his employment. This is the case of an intelligent professional man, under the care of a physician interested in diabetes. And it occurred in 1958.

In 1938, R. D. Lawrence and C. Matters[7] observed, in a classic study, that diabetics suffered great difficulties in their work and employment from the public misconception that they were really invalids. They expressed the opinion at that time that the attitude of government and industry was unjust and that it was a survival of the attitude common in the preinsulin days, when ill health and early death were common among diabetics. Unfortunately, this opinion is still widely held today, 20 years later. The fact is that the life expectancy of diabetics has steadily increased. Recently, Joslin[8] has compared the duration of life after the onset of diabetes among patients who lived during the Nauyn Era (1897-1914) with the last years of the Best Era (1956-1957). In the former, it was 4.9 years after diagnosis, while in the latter it had increased more than three times, to 18.2 years.

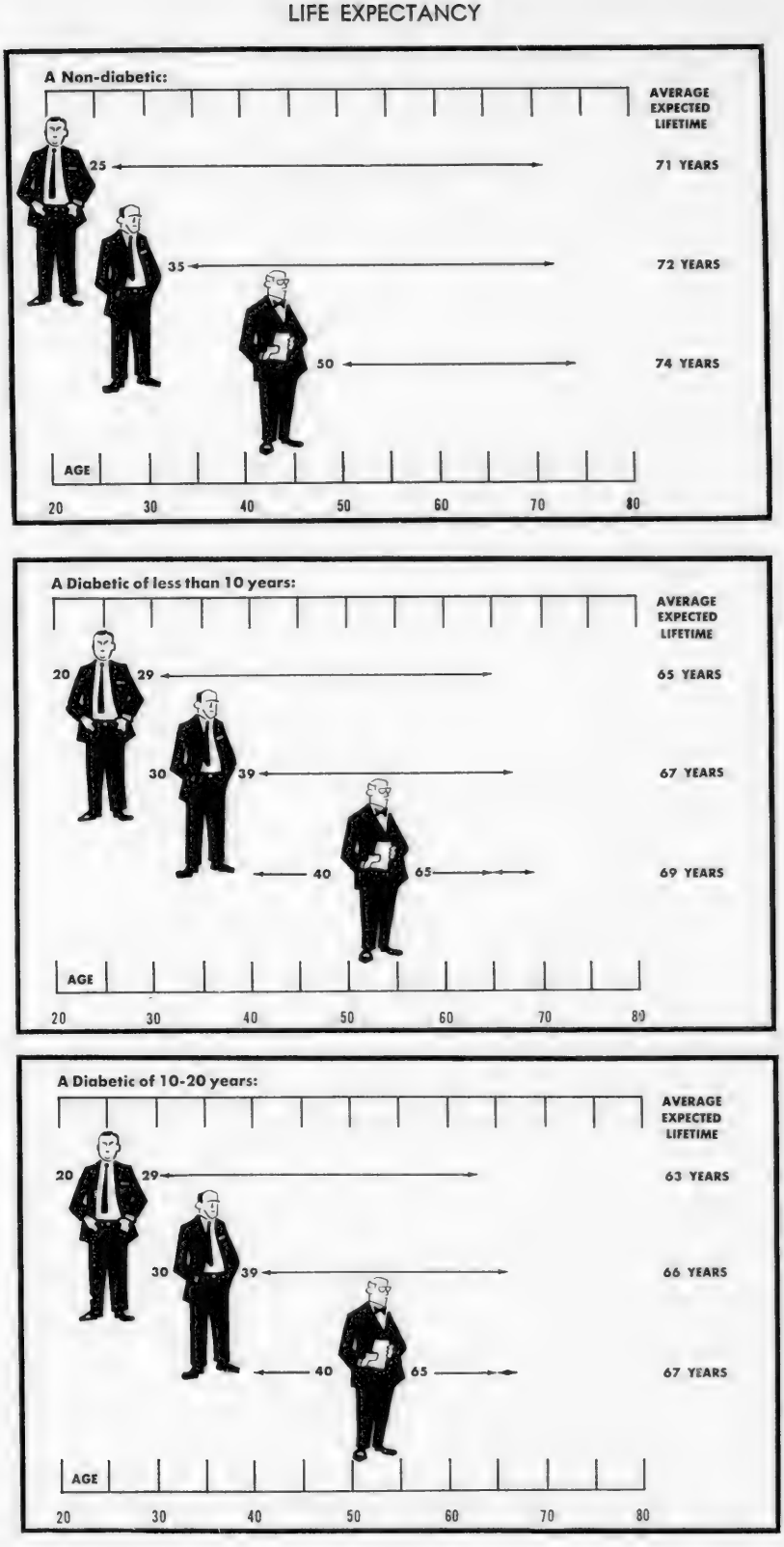
It is difficult to get a clear picture of the life expectancy and mortality of diabetics in these times when new methods of treatment are being presented to the medical profession almost daily. A widely quoted study[9] is that based on the experience of the Joslin Clinic for the five-year period from 1947-1951. It must be remembered that these diabetics first came under observation during the years 1930 through 1951. These data show that the life expectancy of a 30-year-old diabetic was approximately 30.1 years, while that of the general white population was 42.5 years. The mortality rate for the same period (that is, 1947-1951) at age 30 was 15.2 per thousand diabetics compared with 1.5 for the general white population.

The impact of modern medicine on this disease has resulted in increased life expectancy,[10, 11] as shown in the illustrations. A diabetic who has had the disease for less than 10 years at age 30 should expect to live to age 65, whereas a nondiabetic may expect to reach

age 71. The diabetic who has had the disease 10 to 20 years at age 30 should expect to live to age 63.

Medicine is now entering into what Joslin calls the experimental era. We believe that in the coming years the life expectancy of the diabetic will continue to increase and tend to approximate that of the nondiabetic. It has long been known that diabetics, especially uncontrolled diabetics, lack resistance to infection. Indeed, all observers agree that infection results in a severer expression of the disease. Studies[12, 13] show that the urinary tract is particularly susceptible in these individuals. But, with the introduction of sulfonamides and, later, penicillin and tetracycline drugs, a great deal of the danger of infection has been eliminated. Therapeutic use of the sulfonylureas and similar drugs will open doors for the diabetic which are now closed to him. In many instances, they may free him from the use of the insulin syringe and reduce the occurrence of hypoglycemic attacks. Because of their varied clinical expressions, hypoglycemic attacks have sometimes caused the diabetic to be confused with a person under the influence of alcohol or with one suffering from a mental disease.

In recent years, studies have been made regarding the employability of diabetics because of their improved health and longer life expectancy. Soskin[14] has posed two questions in this regard: First, from the standpoint of productivity and absenteeism, do diabetics make good



employees? Second, if they do, does the presence of diabetes in any way affect their capability to carry out the job? Our study is limited to those persons who developed diabetes during their years of employment. Our experience in industry and in large diabetic clinics prompts us to answer Soskin's questions in this way: In the executive and white-collar class, diabetics compare favorably with nondiabetics in terms of productivity and work attendance. The fact that these subjects have diabetes has no significant effect on their ability to do their work.

The statisticians Dublin and Marks, in their study of diabetics in industry, conclude that the work record of diabetics is a satisfactory one and that the large majority of those diabetics who are under good medical care can discharge their duties as well as nondiabetics. They emphasize, as did Lawrence, that even today the diabetic too often has difficulty obtaining and holding a job once the presence of his disease is known. They point out that this policy is due to the fact that the attitude of management has been colored either by unfavorable publicity or by experience with an exceptional case of diabetes. No one questions the fact that there are real problems with the diabetic, but many of these problems no longer have the importance which they once had: witness our ability to treat infections effectively, the improvements in diet, the refinements in insulins, and recently the oral hypoglycemic agents.

The Committee on Employment of the American Diabetes Association[15] has sifted through the information obtained from hundreds of companies employing diabetics. Their information indicates that the diabetic who is well controlled and well regulated and who keeps himself constantly under medical supervision is an acceptable employee. Moreover, because of his self-discipline, a diabetic often becomes an outstanding employee in whatever position he may occupy.

The Committee has formulated certain standards for the employment of diabetics. Among these is a request that the diabetic on seeking employment should bring with him a note from his physician stating how well his disease is controlled. The Committee feels that a diabetic is capable of performing any type of work for which he is physically, educationally, and mentally prepared.

Those individuals who require large doses of insulin should not be assigned work in which the hypoglycemic attacks might be hazardous to themselves or others. The chance discovery in 1955 by German investigators of the hypoglycemic effects of certain sulfonamides—BZ55 (carbutamide) and its successors—might well be the key to this problem. Ideally, the diabetics should have regular working hours, and they should avoid the shift from midnight to 8 a.m. This is the one concession that even well-controlled diabetics should require. As oral hypoglycemic agents are discovered and improved, however, even this concession may be waived. Diabetics using insulin are considered controlled, according to the Committee, if the fasting blood sugar is not below normal limits nor above 150 mg per 100 cc, Folin-Wu; if the three-hour postprandial blood sugar is not higher than 250 mg per 100 cc, Folin-Wu; and if the patient is under regular medical supervision. Should the diabetic be under observation by means of the 24-hour urine sample, we would consider him regulated if he excreted less than 10% of the total available carbohydrate in his diet in 24 hours.

Summary

The diabetic adult who requires no insulin to control his disease presents no problem to management. For purposes of employment, persons in this category may be considered in many instances in the same fashion as nondiabetics. At the other extreme is the uncooperative and poorly regulated diabetic job applicant whom every employer is justified in refusing employment. Such cases can usually be effectively screened out by preemployment interview and examination procedures. Between these two extremes, there is a large group of diabetics who follow their physician's advice and understand their disease and, as a result, are well controlled. When these persons are given appropriate positions, they make good employees.

(Dr. Engelhardt's address is Department of Medicine, Baylor University College of Medicine, Houston, Tex.)

References

1. Root, H. F.: Detection of Diabetes in Industrial Workers, *Indust. Med. & Surg.* 19:266, 1950.

2. Engelhardt, H. T.; Greene, J. A.; and Baird, V. C.: A New Technique for the Detection of Hidden Diabetes, *Diabetes* 2:299, 1953.

3. Engelhardt, H. T., and Wagner, E. L.: Gout, Diabetes Mellitus, and Obesity: A Poorly Appreciated Syndrome, *South. M. J.* 43:51, 1951.

4. Derbes, V. J., and Engelhardt, H. T.: The Treatment of Bronchial Asthma, Philadelphia, J. B. Lippincott Company, 1947, p. 70.

5. Weaver, N. K., and Perret, J. T.: Diabetes in Industry, *South. M. J.* 52:214, 1959.

6. Dublin, L. I., and Marks, H. H.: The Diabetic in Industry and His Employer, *Indust. Med. & Surg.* 19:279, 1950.

7. Lawrence, R. D., and Matters, C.: Employment of Diabetics, *Brit. M. J.* 2:1076, 1938.

8. Joslin, E. P.: Diabetes: First Practical Gains of

the Experimental Era, World Wide Abstracts Of General Medicine, New York, The Excerpta Medica Foundation, Vol. 1, No. 2, 1958, p. 11.

9. Kennedy, J. E. K.: Life Insurance for Diabetics, *Diabetes* 7:320, 1938.

10. Dross, Raymond L.: Personal communication to the authors, Jan. 7, 1959.

11. Trends in Diabetes Control, Health Information Foundation, New York, Vol. 7, No. 2 (Feb.) 1958.

12. Engelhardt, H. T., and Bruno, F. E.: A Clinico-Pathological Study of Diabetes Mellitus in the South, *New Orleans M. & S. J.* 95:137, 1942.

13. Styron, C. W.: The Genito-Urinary System in Diabetes, in Treatment of Diabetes Mellitus, by Joslin, E. P., Ed. 8, Philadelphia, Lea & Febiger, 1946, p. 575.

14. Soskin, S.: Diabetes—Its Relation to Industry, *Indust. Med. & Surg.* 23:106, 1954.

15. Committee on Employment of the American Diabetes Association: Employment of Diabetics, *Diabetes* 1:339, 1952 (revised May 1957).

SEVENTH ANNUAL

PACIFIC NORTHWEST INDUSTRIAL HEALTH CONFERENCE

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Multnomah Hotel, Portland, Oregon

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Cost of Absenteeism—on the job accidents; off the job accidents; sickness absences. Speakers include Robert Hockwald, M.D., Pacific Telephone and Telegraph Company; Don A. Wilhite, Pacific Maritime Association; Donald Osborne, Crown Zellerbach Corporation; Wallace Gordon, P.G.E.; and Edward C. McDowell, Union Carbide Metals Company.

Additional Costs for Health Releated Programs—retirement programs; group health insurance; matched savings; health screening; counseling; noise studies. Speakers include E. A. Aitchinson, Boise-Cascade Corporation; G. A. Okerlund, Puget Sound Pulp and Timber Company; Willard J. Mayfield, Northwest Natural Gas Company; Clinton M. Fair, AFL-CIO; and Gradie Rowntree, M.D., Fawcett-Dearing Printing Company.

Responsibility for Health Programs—the individual's responsibility; management's responsibility; local, state, national government responsibilities. Speakers include S. Bruce Black, Liberty Mutual Insurance Company; George T. Brown, CIO-AFL; R. W. deWeese, ESCO Corporation; Charles McGill, M.D., Northwest Industrial Clinics; Norbert J. Roberts, M.D., Standard Oil Company (New Jersey); and H. Yvonne Gardiner, R.N., Oregon Nurses Association, Inc.

Registration fee for the conference is $10.00 per person. Further information may be obtained from the Portland Chamber of Commerce, Portland, Oregon.

The Cancer Patient in Industry

B. L. Vosburgh, M.D., and H. M. Rozendaal, M.D., Schenectady, N. Y.

THE SCIENTIFIC reasons for hiring or not hiring applicants with cancer histories may be obvious to industrial physicians, but it must be remembered that the actual decision in this matter is one for management. Almost every industry has come to include among its "fringe benefits" a medical benefits plan and life insurance coverage. These vary a great deal in their provisions, but, in general, they protect well against catastrophic illness and death. Their inclusion has given greater emphasis to doctor responsibility in evaluating employment risks. For example, in the General Electric Company, the maximum medical benefit covering catastrophic illness is $15,000 for two years or for life and the company-paid life insurance is two times salary, or an average of $12,000 per employee. This means a potential of more than $25,000 for a serious mistake made by the doctor when admitting some unwarranted serious risk to payroll. Coverage is immediate. It may ease the conscience of the doctor somewhat to realize that these plans are set up as group plans, with costs based on the familiar bell-shaped curve of good, average, and poor risks all pooled together. We are told that anyone may be employed if he is badly needed, even at the risk of high cost. We are also encouraged to employ the handicapped as a good socioeconomic practice.

Everyone knows, however, that some handicapped people do not make good employees, and the doctor soon finds out that very few people are considered "badly needed" if the dollar risk is deemed unwarranted. With reference to cancer, the evaluation should be made by a well-informed doctor, not by the employment office. Management, when well informed, may accept medical judgment that a history of cancer need not automatically eliminate the consideration of employment. When the doctor has evaluated the risk as nominal or slight, the applicant may be favorably considered for employment, provided, of course, he has substantial assets to offset whatever risk has been calculated. This, we repeat, is a management decision, just as the decision to hire any handicapped person usually depends on positive qualities such as "high motivation" and "top skill."

Many insurance companies, aided by very recent mortality data, are now accepting risks such as hypertension and rheumatic heart disease with appropriate premium adjustments. Management with doctor guidance can do the same for some cancer patients. There are now nearly a million 5-year survivors looking for this consideration.

In order to evaluate the individual problem accurately, the physician is required to possess broad knowledge of the most recent statistical information relating to 5-year survival rates and 10-year survival rates, as well as cure rates of malignant tumors involving any part of the body. In addition, in the individual case the doctor should review with the attending physician or surgeon the forms of treatment given, and finally he must consult with the pathologist regarding the histological peculiarities, the grading, radiosensitivity, and lymph node involvement or local invasion of the tumor. In many cases such consideration will quickly lead to a negative decision with respect to employability. We wish to point out certain criteria which may be useful in arriving at more optimistically oriented opinions.

We may first consider the group of cancers most readily available for definitive treatment and therefore carrying a favorable prognosis. We are referring, of course, to skin cancers, which, if properly treated, should carry a near 100% survival rate and should therefore, except for most unusual instances, present no particular problem for the industrial physician.

Presented at the Forty-Fifth Annual Meeting of the Industrial Medical Association, Rochester, N. Y., April 28, 1960.

Dr. Vosburgh is resident physician at the Knolls Atomic Power Laboratory and Medical Consultant to General Electric Company. Dr. Rozendaal is Manager, Biological Studies Section, General Electric Research Laboratory.

In contrast, we can set aside the unfortunately still large group of malignancies which carry such a poor prognosis that patients with diseases falling in this category cannot be considered for industrial employment. Included in this group are patients suffering from acute leukemias and from carcinomas of the lung, stomach, and testis. In making such a sweeping statement we realize, of course, that each case must be studied on its own merits and that nobody can infallibly predict the clinical course of any disease. We will have an opportunity to return to this question shortly.

In between these extremes we find the large group of patients whose clinical findings deserve the serious consideration of the physician who is asked to examine such a person for future employment. This group can be discussed in part by a consideration of malignant disease which carries a 5-year survival rate of approximately 50% or higher and of a disease which is invariably fatal but in which the clinical course may vary in respect to the life expectancy.

Among the first group we may include patients with cancers of the oral cavity, the thyroid, colon, breast, uterus and cervix, and possibly of the prostate gland. The second group consists of the patients with a chronic leukemia and with Hodgkin's disease.

The advice from the attending surgeon and radiologist is greatly desired and indeed essential for the proper evaluation of patients belonging to the first group. As cases in point we may briefly review the opinions of experts concerning the life history of cancer of the thyroid gland.

The pathologists[1] classify thyroid cancer as follows:

(*a*) Adenoma with invasion of blood vessels, lymphatics, or capsule—24.6%.
(*b*) Papillary and follicular adenocarcinoma —46.2%.
(*c*) Carcinoma simplex (small-cell and giant-cell types)—24.6%
(*b*) Miscellaneous—4.6%

The microscopic diagnosis of thyroid cancer may be extremely difficult, and there may exist differences of opinion among experienced pathologists.

Most thyroid tumors develop slowly over a period which has sometimes extended to 25 years. Papillary adenocarcinomas have the most benign clinical course, and patients often live for years, even after lung metastases have occurred. Small-cell carcinomas and giant-cell carcinomas of Group C usually rapidly infiltrate and metastasize. The prognosis in the cases of adenoma with blood vessel invasion is very good, as evidenced by the report of Clute and Warren,[2] who found, of 99 patients, 95 living and well and 1 living with a recurrence at the end of a 3-year minimum follow-up.

The cases with papillary adenocarcinoma have a prognosis which is almost as good, and 80% 5-year survival have been reported by Hare and Salgman,[3] The prognosis here can be relatively good even in the presence of metastases which may respond to treatment with thyroid extract (Crile[4]). In contrast with the above quoted findings, the 5-year survival rate in the giant-cell or small-cell carcinomas, which comprise the third group, appears to be not more than 20%. We therefore have here an excellent example of some of the factors which may influence the prognosis in cancer as well as an illustration of the complexity of the problem facing the industrial physician. Considering the good prognosis in the first two groups, as well as the frequently excellent response to treatment with thyroid hormone if metastases finally do occur, one would feel justified in recommending the accepting of some of these patients for employment.

Similar considerations regarding prognosis must be applied to the problem of cancer of the bowel manifested by cancer in a polypoid adenoma. Many of these polyps are found during the course of routine physical examinations. The polyps, which should be removed by polypectomy followed by fulguration of the base, may in 8% of the cases show the presence of carcinoma in situ and in about 3% an invasive carcinoma.[9] Fortunately, it is now becoming evident that the prognosis in these cases is very favorable and that therefore these people may be considered for employment.

In Hodgkin's disease as well as in chronic leukemias, one is confronted with a different problem which again may tax the acumen of the physician. Many reports have testified to the variation in clinical course in these diseases. The Connecticut state 5-year survival ratio[10] for malignancy of the lymphatic system is 20% and that for malignancy of the hemopoietic system is 10%. In Hodgkin's disease we may be assisted in our judgment regarding prognosis by the extent and distribution of the lesions as well as by the findings of the microscopic examination.

Jelliffe and Thompson[5] have applied the grading system of Jackson and Parker to their series and report as follows:

Grade I: Paragranuloma—good prognosis; of 41 patients, 15 were alive and well five years or more after the original diagnosis.

Grade II: Granuloma—in 237 cases the average 50% survival was two and one-half years.

Grade III: Sarcoma—of 51 patients, all were dead within one year following the diagnosis.

These patients can be classified also according to the stage of the disease as follows:

Stage I: Lymph node involvement in only one group.

Stage II: Lymph node involvement in two or more adjacent groups.

Stage III: Generalized lymph node involvement.

The prognosis in Stage III is particularly poor and becomes greatly better in the other two groups. With the aid of these two classifications one may attempt to venture a guarded clinical guess as to the outcome in the individual case. We all have seen patients with Hodgkin's disease live 10 years or more following the original diagnosis, and it seems worth while to keep such happy developments in mind whenever one has to decide the fate of a patient in whom the biopsy has shown the presence of this disease.

The prognosis of chronic leukemia is in many cases even more uncertain than of Hodgkin's disease. It has been stated that when leukemia is discovered accidentally in the absence of symptoms, considerable periods (two to five years) many have elapsed before symptoms are first noted (Wintrobe and Hasenbush[6]). Low hemoglobin level or thrombocytopenia at an early stage definitely suggests a relatively short survival. Spontaneous remissions have been noted in very variable proportions in different series of cases. Influence of treatment upon the course of the disease is debatable, and only Osgood and associates[7] have been able to show evidence that carefully administered total body radiation in small doses can prolong life.

We are all acquainted with the patients with chronic leukemia who, under therapy, return to clinical and hematologic health and remain so for several years. These patients can meet the demands of their occupation without difficulties and can thus make valuable contributions. But because of the unpredictable course one must hesitate and probably refuse to consider such patients for new employment except under very unusual circumstances.

Summary

It appears justifiable to consider employment for certain individuals suffering from malignant disease.

The criteria for certain cases are discussed.

The consequences of such decision in terms of company's interest are reviewed.

(Dr. Vosburgh's address is 1 River Road, Schenectady 9, N.Y.)

References

1. Ackerman and Regato: Cancer: Diagnosis, Treatment and Prognosis, St. Louis, C. V. Mosby Company, 1954, pp. 476-478.

2. Clute, H. M., and Warren, S.: The Prognosis of Thyroid Cancer, *Surg. Gynec. & Obst.* 60:861-874, 1935.

3. Hare, H. F., and Salzman, F. A.: Cancer of the Thyroid, *Am. J. Roentgenol.* 63:881-887, 1950.

4. Crile, G., Jr.: Cancer of the Thyroid, *J. Clin. Endocrinol.* 10:1152-1170, 1950.

5. Jelliffe, A. M., and Thompson, A. D.: The Prognosis in Hodgkin's Disease, *Brit. J. Cancer* 9:21-36 March, 1955.

6. Wintrobe, M. M., and Hasenbush, L. L.: Chronic Leukemia, *Arch. Int. Med.* 64.:701, 1939.

7. Osgood, E. E.; Seaman, A. J.; and Koler, R. D.: Natural History and Course of the Leukemias, in Proceedings of the Third National Cancer Conference, Philadelphia, J. B. Lippincott Company, 1957.

8. Dameshek, W., and Gunz, F.: Leukemia. New York, Grune & Stratton, 1958.

9. Hazard. Personal communication to the authors, Jan. 1960.

10. Cancer in Connecticut, 1935-1951. 49 (1955).

Nature of the Chromium Extracted from Leather by Sweat

M. H. Samitz, M.D., Sidney Katz, A.B., and Sidney Gross, M.D., Philadelphia, Pa.

PREVIOUS work[1] was directed to the determination of trivalent and hexavalent chromium in chrome-tanned leathers and in extracts of these leathers by sweat. The results of this study revealed the presence of trivalent and hexavalent chromium in both the leather samples and the sweat extracts of these leathers. The present investigation is concentrated on the nature of the chromium extracted from the leathers by sweat.

Classical chemical methods could not be applied to this study. There was danger that the addition of any chemical reagent would cause the hydrolysis or condensation of the chromium-containing compounds. In order to study the nature of the chromium in the sweat extracts without secondary chemical reactions, a spectrophotometric method of analysis was chosen. This method is based on the finding that different chromium-containing compounds have different absorption spectra.

In order to carry out this study, a series of reference curves for known chromium compounds had to be prepared. Previous work[1] has shown that the chromium concentration in the sweat extracts was of the order of 100 gamma/ml. Therefore, a series of solutions of chromium-containing compounds containing 100 gamma/ml of chromium were prepared. Absorption spectra for these compounds were obtained by recording their optical densities in the 350 to 950 mμ (millimicron) range. The data from this study are recorded in Table I.

Prior to the spectrophotometric study of the sweat extracts, the samples were centrifuged for 30 minutes to remove suspended matter.* The absorption spectra of the sweat extracts were then investigated in the 350 to 950 mμ range by recording their optical densities (Table II).

Table I—Absorption Spectra Data for Various Chromium Containing Compounds

Chromium Compound	Absorption Maxima	Absorption Minima
$CrCl_3 \cdot 6H_2O$	410, 570	480, 700
$Cr(NO_3)_3 \cdot 9H_2O$	410, 570	480, 690
$Cr_2(SO_4)_3 \cdot 15H_2O$	420, 580	500, 710
Basic Chrome Sulfate	420, 580	500, 700
K_2CrO_4	350, 430	520 to 950
$K_2Cr_2O_7$	350, 430	520 to 950
Na_2CrO_4	350, 430	520 to 950
$Na_2Cr_2O_7$	350, 430	520 to 950

Table II—Absorption Spectra Data for Sweat Extracts

Sample Number	Absorption Maxima	Absorption Minima	
1	350, 425, 480-520,	765	700
2	350, 430, 475-520,	770	705
3	350, 430, 475-500,	770	700
4	350, 425, 480-500,	765	700
5	350, 430, 480-520, 580	770	700
6	350, 425, 480-515,	770	705
7	350, 425, 475-520,	765	700
8	350, 430, 480-515, 580,	770	700
9	350, 430, 475-520,	770	700
10	350, 430, 475-520, 580,	770	695
Sweat	475-525,	770-950	700

*Other chromium containing compounds were found in the suspended matter. As of the present, we are unable to say if this chromium is the same or different from the soluble types reported. This suspended material may be protein combined with chromium, or it may be chromium adsorbed on the surface of protein material. Further investigation will be carried out to determine the nature of this material.

From the Section of Industrial Dermatology, Department of Dermatology (Donald M. Pillsbury, M.D., Director), School of Medicine, University of Pennsylvania. This investigation was supported by a grant (No. E 2346) from the Division of Research Grants, United States Public Health Service.

Submitted for publication March 29, 1960.

From the data in Table I, characteristic absorption maxima and minima were assigned to the various types of chromium compounds studied. The hydrated chromic ion was found to absorb at 410 and 570 mμ, with minima at 480 and 695 ± 5 mμ. The corresponding figures for the basic chrome sulfate complex were 420 and 580 mμ, with minima at 500 and 705 ± 5 mμ. The chromate ion, and the dichromate ion in dilute solutions, was found to absorb at 350 and 430 mμ, with minimal absorption in the 530 to 950 mμ range.

Investigation of the absorption spectra of the sweat used in the extractions showed absorption maxima in the 475 to 525 and 770 to 950 mμ range, with a maximum at 700 mμ.

The absorption spectra of the sweat extracts all showed absorption maxima at 350, 425 to 430, 475 to 520, and 765 to 950 mμ and a minimum at 695 to 705 mμ. In addition to these maxima and minima, extracts 5, 8, and 10 showed maxima at 580 mμ. These maxima and minima are interpreted as follows:

1. The absorption maxima at 350 are due to the chromate ion
2. The absorption maxima at 425 to 430 are due to the chromate ion
3. The absorption maxima at 475 to 520 are due to the sweat
4. The absorption maxima at 765 to 950 are due to the sweat
5. The absorption minima at 695 to 705 are due to either the hydrated chromic ion, the basic chrome sulfate complex, the chromate ion, or the sweat
6. The absorption maxima at 580 are due to the basic chrome sulfate complex.

Conclusions

From the above study, it is concluded that the trivalent chromium extracted from leather by sweat is in the form of a basic chrome sulfate complex similar to the sample studies,*[2] and that the hexavalent chromium is in the form of the chromate ion. The analytical data confirm our previous findings[1] that the chromium compounds extracted by sweat from chrome-tanned leathers were both hexavalent and trivalent and do not support previous reports[2] which contend that hexavalent chromates are not found in shoe leather. Since hexavalent chromium compounds are leached out by sweat, they cannot be dismissed as possible contractants since Cr_6 is a well-known sensitizer.

(Dr. Samitz's address is 1715 Pine St., Philadelphia 3, Pa.)

*Basic chrome sulfate complex supplied through courtesy of George E. Morris, M.D.

References

1. Samitz, M. H., and Gross, S.: Extraction by Sweat of Chromium from Chrome Tanned Leathers, *J. Occ. Med.* 2:12-14 (Jan.) 1960.

2. Morris, G. E.: "Chrome" Dermatitis, *A.M.A. Arch. Indust. Health* 78:612-618 (Nov.) 1958.

THE SILVER ANNIVERSARY MEETING

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Appraisal of a Single Lead Electrocardiogram

—A REPORT ON 2,594 ELECTROCARDIOGRAMS—

Edward M. Kline, M.D., Cleveland, Ohio

ELECTROCARDIOGRAMS included in the examination of a large number of industrial workers have been studied to determine the yield of the conventional 12-lead record and to compare this with the diagnostic reliability of a single lead, a technique sometimes employed in "screening" procedures.

In performing 7,508 examinations of a working industrial population,* 2,594 electrocardiograms were made. These studies were included as part of the examination of all men 40 years of age and older, and women aged 45 and older. Electrocardiograms were made for certain other persons in whom, by history or examination, heart disease was either known or suspected. Since these were "on-the-job" examinations, the number of persons falling into the latter group was rather small.

These electrocardiograms were studied with the following objectives in mind: (1) the frequency of abnormal curves, (2) the occurrence rate of some particular electrocardiographic abnormalities, and (3) an appraisal of the reliability of a single lead, for example, Lead I, as a possible substitute for the standard 12-lead technique. The conventional 12 leads were included in all the electrocardiograms discussed.

The Frequency of Abnormal Curves

Of the 2,594 electrocardiograms, 143 (or 5.5%) were considered abnormal. This rate of abnormality is considerably lower than the 298 (15%) abnormal curves from a total of 2,000 electrocardiograms found in a somewhat similar study reported by Kline and Hess[1] in 1947. This difference can be explained by the fact that the earlier observations were made between April 1943 and August 1945—a time of acute man power shortage when many "marginal" workers, from point of view of both age and health, were included in the working force.

The Occurrence Rate of Some Particular Electrocardiographic Abnormalities

This rate can best be demonstrated in the accompanying Table I and, in general, reflects the distribution that one would expect from a group of persons selected in this way. In addition to the curves that were considered definitely abnormal, there were 22 suggestive of left ventricular hypertrophy and 2 suggestive of right ventricular hypertrophy. In none of these situations were the changes striking

*Table I—Abnormal Electrocardiograms**

Abnormal rhythm	
Auricular fibrillation	3
Atrial abnormalities	
Atrial hypertrophy, left	7
Atrial hypertrophy, right	2
Conduction defects	
Prolonged P-R interval (0.24 sec. or greater)	4
Complete A-V block	1
I-V conduction defect	10
Incomplete right bundle-branch block	14
Incomplete left bundle-branch block	2
Right bundle-branch block	25
Left bundle-branch block	6
Myocardial changes	
Nonspecific T-wave changes	12
Coronary insufficiency	8
Abnormal left axis deviation	1
Infarction	
Anterior myocardial infarction, recent	2
Posterior myocardial infarction, recent	1
Anterior myocardial infarction, old	3
Posterior myocardial infarction, old	7
Hypertrophy	
Left ventricular hypertrophy	30
Right ventricular hypertrophy	5
	143

*Analysis of 143 abnormal electrocardiograms among 2,594 electrocardiograms routinely made of industrially employed men aged 40 and older and women aged 45 and older.

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*Lamp Division, General Electric Co.

Table II—Analysis of Individual Leads in 143 Abnormal Electrocardiograms

Leads	Normal	Borderline	Abnormal But Not Diagnostic	Diagnostic	Abnormal*
I	51	18	22	53	75
II	26	16	80	22	102
III	44	26	62	12	74
aVR	57	29	30	28	58
aVL	45	23	50	26	76
aVF	52	25	51	15	66
V_1	67	25	19	33	52
V_2	65	25	32	22	54
V_3	61	24	40	19	59
V_4	58	21	41	24	65
V_5	50	20	44	30	74
V_6	43	21	42	38	80

*This column includes all abnormal electrocardiograms and is the total of the columns designated "Abnormal But Not Diagnostic" and "Diagnostic."

enough to permit a positive electrocardiographic diagnosis of these conditions.

Diagnostic Reliability of Any Single Lead

Since the limitations of the electrocardiogram as a screening device for heart disease are well recognized, it has been suggested that its general use for this purpose might be justified if the procedure could be made less costly and time-consuming by recording fewer leads, or perhaps just a single lead. It has been proposed[2,3] that Lead I would serve this purpose and still retain most of the screening value of the complete 12-lead electrocardiograms. Weintraub,[4] on the other hand, reporting on 200 abnormal 12-lead electrocardiograms taken at the Sidney Hillman Health Center, did not confirm this proposal. Among the 200 abnormal curves, he found Lead I normal in 52 cases (26%). Similarly, of the 143 abnormal electrocardiograms reported here, Lead I was normal in more than a third of the cases (51). Looked at another way, Lead I alone would have detected only a little more than half of the abnormal cases (75) and in only a third (53) would it have permitted an adequate electrocardiographic diagnosis. From the data in Table II, a single Lead II would appear to have greater value. Although it was less often diagnostic (22 cases) than Lead I, abnormalities taken as a whole were detected more frequently (102 cases).

In order to determine the differences in recording time between a single-lead and a 12-lead electrocardiogram, six technicians were timed by stop watch as they prepared the patient, made the recording, and cleaned the equipment. Although these observations revealed that a time-saving of approximately 30% could be effected in the recording of a single-lead electrocardiogram, the total time required for the complete procedure was so small (5 minutes 45 seconds average), that the economy amounted to slightly less than two minutes. The cost of electrocardiographic paper is not an important item, being somewhat less than 10¢ for the amount required for a 12-lead electrocardiogram.

Since the larger fixed costs of equipment and interpretation are the same for either a single-lead screening electrocardiogram or a standard 12-lead recording, the saving in technician's time and supplies is so small by comparison as to be of no consequence.

To compromise the yield from electrocardiograms in a health examination program of the type reported here by any "abbreviated" form of record would seriously jeopardize its value as a part of the over-all examination procedure.

Summary

1. As a part of 7,508 on-the-job physical examinations, 2,594 standard 12-lead electrocardiograms were made.

2. Abnormalities were found in 143 (5.5%) of the electrocardiograms.

3. The saving in time and materials of a single-lead electrocardiogram as compared with a complete electrocardiographic recording is so small as to be of no practical consequence.

4. No single lead, when employed as a screening technique, was of sufficient diagnostic value to warrant its substitution for the customary 12-lead electrocardiogram.

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References

1. Kline, E. M., and Hess, J. H.: The Electrocardiograph in Industrial Medical Practice: A Report Based on 2000 Electrocardiograms, *Ohio M. J.* 43:54-56 (Jan.) 1947.

2. Electrocardiograms for Screening Purposes, Queries and Minor Notes, *J.A.M.A.* 151:1155 (March 28) 1953.

3. Dawber, T. R.; Kannel, W. B.; Love, D. E.; and Streeper, R. B.: The Electrocardiogram in Heart Disease Detection; A Comparison of the Multiple and Single Lead Procedures, *Circulation* 5:559-566 (April) 1952.

4. Weintraub, H. J.: Evaluation of Lead I as a Screening Technique for Heart Disease, *J.A.M.A.* 158: 178-179 (May 21) 1955.

Air Pollution from Automobile Exhaust

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THERE are seven million motor vehicles in California. They use fifteen million gallons of gasoline daily and produce about eighteen billion cubic feet per day of exhaust gases. If all the gasoline fed to the combustion chambers of an internal-combustion engine were burned completely to carbon dioxide and water vapor, we would have no air pollution problem. But 5% to 7% of the gasoline fed to the engine does not burn completely. Atmospheric pollution results.

Nature of Auto Exhaust

Obvious pollutants in motor vehicle exhaust are smoke, carbon monoxide, nitrogen oxides, lead salts, aldehydes, and perhaps sulfur dioxide. Less obvious pollutants are various hydrocarbons from unburned gasoline and its cracked products and the variety of gasoline additives that may remain unburned or partially burned in the exhaust gases.

An important operating characteristic of the spark-ignited internal-combustion engine is the absence of sufficient air to burn all the gasoline fed to the combustion chambers. This so-called "rich" mixture fed to the cylinders (combustion chambers) of the engine is responsible, therefore, for the carbon monoxide, unburned and cracked hydrocarbons, and hydrocarbon partial oxidation products found in motor vehicle exhaust. The lead salts stem from tetraethyllead added to the gasoline for its antiknock properties. The nitrogen oxides represent the burning of some of the nitrogen in the air in the combustion chamber to nitric oxide, but, unlike the emissions of unburned hydrocarbons, nitric oxide formation is favored by "lean" mixtures.

Accordingly, the emissions from a given motor vehicle are not uniform, but vary considerably. During idling and deceleration, fuel flows to the intake manifold and then to the cylinders only through the idling jet of the carburetor, and the air flow is restricted to a minimum. During deceleration, the high-speed pumping action of the cylinders, powered by the momentum of the automobile, creates a high vacuum in the cylinders, under which condition of short residence time the fuel burns poorly, if at all. During acceleration and cruising, high temperatures and poor mixing lead to high rate of nitrogen fixation as NO. The rapid quenching of the exhaust gases as they leave the cylinder does not allow sufficient time for nitric oxide decomposition; hence, the concentration remains high.

Types of Hydrocarbons in Exhaust—During the past year a great deal of information has become available on the types and amounts of different hydrocarbons in motor vehicle exhaust. The principal hydrocarbons present are methane, acetylene, and ethylene compounds that would be expected to result from high-temperature cracking of gasoline hydrocarbons. Other hydrocarbons not present in the original gasoline but also always present in exhaust gases are ethane, propane, propylene, and the various butylenes, including butadiene. Some of the hydrocarbons above C_4s found in exhaust gases could only be those originally present in the gasoline used; others, such as the hexenes, could be either cracked products or unchanged fuel components.

The nature and amount of oxygenated organic compounds in exhaust are not well authenticated. Formaldehyde is probably the only important species.

Effect of Engine Variables on Exhaust Composition—With such great variations of residence time, temperature, pressure, and concentration occurring in the cylinders of the automobile, it is obvious that the type and concentration of exhaust constituents must vary considerably, depending on the design and condition of the automotive engine and how it is operated. Some of the more important engine variables are air-fuel ratio, spark-plug condition, and cylinder vacuum.[3]

Generally speaking, the air-fuel ratio affects

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emissions of carbon monoxide, hydrocarbons, and nitrogen oxides. Rich mixtures (more fuel and less air than required for the stoichiometric ratio) favor carbon monoxide and hydrocarbon emissions; lean mixtures promote formation of oxides of nitrogen.

Manifold vacuum above 21.5 in. Hg, commonly reached at the start of deceleration from high speeds, allows high concentration of hydrocarbons to appear in the exhaust gases. These high vacuums are also favored when shifting gears by manual transmissions, as compared with automatic transmissions.

Engine speed, particularly during cruising, affects oxides of nitrogen values markedly; high engine speeds favor nitrogen fixation. Contrariwise, hydrocarbon concentration tends to drop at high speeds. High air flows during acceleration also favor nitric oxide formation, but the effect on hydrocarbon concentration is variable, apparently depending on the carburetor-transmission package.

Spark-plug condition is extremely important. A fouled plug will allow most of the fuel fed to a cylinder to be exhausted practically unburned. Similarly, a misfiring plug will contribute to hydrocarbon emissions in proportion to the frequency of misfiring. J. M. Chandler, of Ford Motor Company, has pointed out that a deposit-fouled spark-plug set can increase the rate of hydrocarbon emission during a wide-open throttle acceleration more than two and one-half times.[2]

Effect of Driving Cycle—Exhaust emissions also depend to a considerable extent on the manner in which a vehicle is driven. Concentrations of carbon monoxide, hydrocarbons, and nitrogen oxides in the exhaust gases vary markedly from one operating cycle to another; flow rates also vary considerably. Inasmuch as the total emission (the product of flow rate and concentration) will be different for each cycle, the percentage of time spent in the various cycles will affect the total emissions of a given car. Further, the type and rate of acceleration and deceleration and the cruising speed will also have marked effects.

A survey conducted by the Automobile Manufacturers Association determined an average traffic pattern for Los Angeles.[10] However, great individual deviations from the average were found, exemplified by one "jack rabbit" driver who accelerated or braked 43% of the time versus a "cautious" driver who accelerated and decelerated only 20% of the time. Thus, in the light of these marked differences among drivers, superimposed on even greater differences among automobiles in their emissions, average emissions become almost meaningless. Some recent models of automobiles have remarkably low hydrocarbon emissions, but are quite high in nitric oxide formation. Older cars in poor condition have just the opposite pattern.

Aerosol Emissions—The two important aerosols emitted from the tailpipes of motor vehicles are smoke and lead compounds. Blue smoke arises primarily from partially burned lubricating oil that has leaked into the cylinder and appears to be a function of engine condition. Black smoke appears when very rich carburetor settings are used and represents soot formed by cracking.

Since nearly all gasolines must contain tetraethyllead to confer adequate antiknock properties to the fuel, the exhaust contains a finely divided aerosol of lead compounds, chiefly $PbCl \bullet Br$, $NH_4Cl \bullet Br$, and $2NH_4Cl \bullet PbCl \bullet Br$. The number and size of the particles have been investigated by D. A. Hirschler.[1]

Smog Effects of Auto Exhaust

For many years the main concern relative to automobile exhaust gases in the atmosphere was carbon monoxide. The maximum allowable concentration (MAC) for 8 hours' exposure is 100 ppm. During intense smog in Los Angeles, concentrations up to 75 ppm have been determined. Just what the MAC should be for a 24-hour exposure of the general public to carbon monoxide is moot.

A gas becoming increasingly important is nitrogen oxide. Although the chief form in exhaust gases is nitric oxide (NO), it oxidizes to NO_2 in the open atmosphere. The MAC for NO is 25 ppm; for NO_2 5 ppm. Values as high as 1.86 ppm (NO and NO_2) have been measured in Los Angeles.

Hydrocarbons per se are certainly not a health hazard in the quantities found in the atmosphere. The MAC for gasoline is 500 ppm; 5 ppm is the highest value found in Los Angeles (near a petroleum refinery). The most toxic common hydrocarbon, benzene, has an MAC of 25 ppm. Certain hydrocarbons are very important, however, in the photochemical smog reaction that produces ozone, eye irritation, plant damage, etc. This will be discussed later.

The importance of smoke in auto exhaust lies in its carcinogenic properties. Benzpyrene, a proved carcinogenic agent, has been found in auto exhaust. It is similarly present in coal smoke. It has also been postulated that benzpyrene and similar condensed aromatics in the atmosphere may result from atmospheric

dehydrogenation of simple gas-phase aromatics in auto exhaust.[5]

Lead-containing aerosols have been the object of considerable study ever since the advent of tetraethyllead as an antiknock agent. The MAC for lead dusts, fumes, and mists is 200 μ/cu m. Average values reported by Leslie Chambers[1] for 30 American cities ranged from 0.1 to 9.5μ/cu m.

It will be noted that automobile exhaust is a possible health hazard and that this is related to the toxicity of the individual components. Atmospheric concentrations seldom, if ever, approach the MAC values; hence any concern over the health of the general public must be related to the long-term effects of much lower concentration levels. Whether such concern is warranted is a matter for physicians and toxicologists.

Photochemical Smog—One aspect of air pollution from automobile exhaust gases that poses more immediate problems than those related to the long-term toxicity of exhaust gas components is photochemical smog. The most thorough studies of this phenomenon have been made in the Air Pollution Foundation's smog chamber at Stanford Research Institute in South Pasadena, Calif., where automobile exhaust gases are diluted with purified air and subjected to simulated sunlight by means of banks of mercury-arc and fluorescent lamps.[6, 8]

Under certain conditions, irradiation of exhaust gases in concentrations similar to those experienced in the Los Angeles atmosphere produces a high ozone content in the air, pronounced eye irritation, and a large increase in aerosols of visibility-blurring size. It has also been shown that typical vegetation damage could be expected.[9] These are the common manifestations of photochemical smog, widely spread on the West Coast and occurring sporadically and increasingly often in urban communities of the East and Middle West. It is interesting to note that the only way in which the undesirable manifestations of Los Angeles-type smog can be reproduced in the chamber is by irradiation of automobile exhaust or selected exhaust constituents (e.g., olefinic hydrocarbons and nitrogen oxides). No other materials at concentrations found in the atmosphere can be made to produce smog symptoms.

During the past year, work in the smog chamber at Stanford Research Institute has dealt with the atmospheric reactions between oxides of nitrogen and various types of hydrocarbons that might be found in exhaust, in the presence of simulated sunlight. Tentative conclusions drawn by the Air Pollution Foundation from this study[7] are listed as follows:

1. The probable eye irritants in photochemical smog are formaldehyde and acrolein.*

2. These aldehydes are formed only from olefinic hydrocarbons. Similarly, the only organic compounds involved in photochemical aerosol formation appear to be olefins.

3. Paraffinic and aromatic hydrocarbons are not involved to any appreciable degree in the production of smog manifestations. The only exception is the comparatively slow photooxidation of certain branched-chain paraffins to produce ozone. From a practical standpoint, this reaction is probably unimportant.

4. Accordingly, Los Angeles-type smog can be eliminated by drastic curtailment of atmospheric olefins.

It may also be possible to eliminate smog by control of the nitrogen oxides in exhaust gases. Studies of this possibility are presently under way.

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*Peroxyacetyl nitrate may also contribute to eye irritation."

References

1. Chambers, L. A.; Foter, M. J.; and Cholak, J.: in Proceedings of the Third Natl. Air Poliution Symposium, Pasadena, Calif., 1955.

2. Chandler, J. M.: Effects of Engine Operating Variables on the Composition of Automotive Exhaust Gases, presented at the 23d Midyear Meeting, Division of Refining, American Petroleum Institute, Los Angeles, Calif., 1958.

3. Faith, W. L.; Renzetti, N. A.; and Rogers, L. H.: Automobile Exhaust and Smog Formation, Air Pollution Foundation, San Marino, Calif., Report 21, 1957.

4. Hirschler, D. A., et al.: Particulate Lead Compounds in Exhaust Gas, *Indust. Engin. Chem. 49:* 1131, 1957.

5. Ripperton, L. A., and Johnston, D. R.: Atmospheric Dehydrogenation of Organic Compounds, presented at the 52d Annual Meeting, Air Pollution Control Association, Los Angeles, Calif., 1959.

6. Schuck, E. A.: Eye Irritation from Irradiated Auto Exhaust, Air Pollution Foundation, San Marino, Calif., Report 18, 1957.

7. Schuck, E. A., and Doyle, G. J.: Photooxidation of Hydrocarbons in Mixtures Containing Oxides of Nitrogen and Sulfur Dioxide, Air Pollution Foundation, San Marino, Calif., Report 29, 1959.

8. Schuck, E. A.; Ford, H. W.; and Stephens, E. R., Air Pollution Effects of Irradiated Automobile Exhaust as Related to Fuel Composition, Air Pollution Foundation, San Marino, Calif., Report 26, 1958.

9. Stephens, E. R.; Darley, E. F.; Taylor, O. C.; and Scott, W. E., Photochemical Reaction Products in Air Pollution, presented at the 25th Midyear Meeting, Division of Refining, American Petroleum Institute, Detroit, May, 1960.

10. Teague, D. M., et al., "Los Angeles Traffic Pattern Survey," S.A.E. National West Coast Meeting, Seattle, Wash., Aug., 1957.

Topical Review

The Toxicology of Some Aliphatic Alcohols—Part I

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THE ALCOHOLS are the single most important homologous series of aliphatic chemicals included among the industrial solvents. This importance is derived from their extensive use, the volumes produced, the historical position of ethyl alcohol, and the unusual toxic effects of methyl alcohol. They are found in all sorts of household articles, such as cleaners, paint thinners, and furniture polishes, and in preparations for the person from hair tonics to foot medicaments. Because of their varied uses, large groups of people can be affected unknowingly by the alcohols in uncommon ways, as by the use of long-chain alcohols to prevent the evaporation of water from reservoirs in arid areas where conservation of water is necessary. Hexadecanol (C_{16}) and octadecanol (C_{18}), which are metabolized like fatty acids, have been found to be acceptable for this purpose.[1] The hydroxyl radical has an affinity for water into which it dissolves, whereas the hydrocarbon moiety is not water-soluble. The result is a monomolecular alcohol film on the water surface which prevents evaporation.

The approximate millions of gallons of alcohols produced in 1957 have been reported[2] as methanol,[a] 210; ethanol,[b] 223; isopropanol,[c] 180; and butanol,[d] 71. About 14% of the ethanol is made by fermentation and the rest synthetically. More than half of the isopropanol is used to manufacture acetone, and normal butanol comprises less than half of the total production of butanols. Alcohol, which means ethyl alcohol unless otherwise specified, has been known since the dawn of civilization. As a solvent, it has been second only to water in its effectiveness and the length of time it has been used. In addition to its solvent action, early man learned of the physiological effect of fermented beverages and apparently liked the effect. It has been conjectured that certain ethnic groups acquired the custom of drinking beer and wine on a national scale when consumption of fermented beverages was observed to cause less harmful results than some polluted waters. Morbidity and mortality from the alcohols are greater than from all the other homologous series previously considered in these reviews. Through its use as a beverage, ethanol causes the greatest morbidity, but the incidence of serious illness and death from methanol exceeds that of all the other alcohols combined.

The succeeding sections will be devoted to comparing the toxicities of the shorter-chain aliphatic alcohols, discussing the chemistry and nomenclature of the series, and considering some of the individual members in some detail.

Summary of Action

The members of the homologous series of alcohols are irritating to mucous membranes and have measurable toxicities, narcotic effects, and disinfectant actions.

Estimations have been made of the concentrations of vapors of certain alcohols which can be comfortably tolerated for an eight-hour period by a majority of human subjects, or, contrawise, produce irritation of the eyes, nose, or throat.[3, 4] The recommended threshold limit values[5] in parts per million of alcohols studied in this way are shown in Table I for alcohols

Table I—Relation of Estimated Satisfactory Concentrations and Threshold Limit Values

Alcohol	Satisfactory Concentration, ppm	Threshold Limit, ppm
Isopropyl alcohol	200	400
n-Butyl alcohol	25	100
Isoamyl alcohol	100	100
Methyl isobutyl carbinol	25	25
Diisobutyl carbinol	5	N.L.

N.L.—not listed.

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of increasing molecular size from C_3 to C_9. Although there is some disagreement as to the concentrations that are satisfactory (comfortably tolerated) and the threshold limit, it will be seen that human acceptance and the limit values decrease as the molecular size of alcohols increases.

Larson, Finnegan, and Haag,[6] using their method of quantitatively evaluating the edema-producing potencies (EPP) of chemicals-in-water solutions on mucous membranes, demonstrated that the EPP of primary saturated alcohols increased rapidly with increased molecular weight. Their studies were made with alcohols up to and including 5-carbon molecules, beyond which the alcohols were too insoluble in water to be tested. Among the positional butyl isomers, the order of increasing irritation was *tert*-butyl alcohol, *sec*-butyl alcohol, and *n*-butyl alcohol. The *iso* compound, isobutyl alcohol, was slightly less irritating than *n*-butanol. These authors reported that, contrary to observations upon other homologous series, the unsaturated, 3-carbon allyl alcohol was distinctly less irritating than saturated, 3-carbon propyl alcohol. This observation is difficult to explain.

The observed order of the toxicity of alcohols, as with other series of compounds, is somewhat dependent upon the method of study. Different species, cells, or cultures and different routes of administration can demonstrate relative toxicities which are not the same. The single oral LD_{50}'s for rats in grams per kilogram for alcohols have been reported by Smyth and his co-workers.[7-9] Welch and Slocum[10] quoted Woodward's acute oral toxicity for rats in grams per kilogram but not the LD_{50}. The data of both these reports are listed in Table II and are observed to agree relatively but not absolutely, probably reflecting different testing techniques and end points. The table indicates that the alcohols increase in toxicity to C_4-C_5, and then decrease.

Welch and Slocum, using the inhibition of phagocytosis of human and rat leukocytes as a criterion of toxicity were able to show a definite progressive order of toxicity with increasing molecular weight of the alcohols. They also showed that when the effective doses were computed as molar concentrations and when compared to that of ethyl alcohol assigned 1 the ratio increased by a factor of 3 for the addition of each carbon in the series. These data are shown in Table III.

Stiles and Stirk[11] measured the effect of many alcohols on the potato tuber. Their data showed that normal alcohols are the most toxic of a group of isomeric compounds and the toxicity of isomers changes with branching of the chain and location of the hydroxyl group. The toxicity of primary, secondary, and tertiary alcohols decreases in that order. Among normal alcohols, each additional carbon increases the toxicity by a factor of about 3. The increase in toxicity is greatest when the carbon is added terminally on the chain. When additions are made elsewhere in the chain, proximity of the added carbon to the hydroxyl group minimizes the change in toxicity.

Table II—Relation of LD_{50} and Acute Oral Toxicity

Alcohol	LD_{50}, gm/kg	Acute Oral Toxicity, gm/kg
Methyl	12.9	9.1
Ethyl	21.3	7.4
Propyl	1.87	3.3
Butyl	4.36	2.75
Amyl	3.88*	3.3
Hexyl	4.59	4.1
Heptyl	3.25	6.6 (approx.)

*Mixed amyl alcohols

Table III—Toxicity as Measured by Inhibition of Phagocytosis

Alcohol	Toxic Dilution	Molar Ratios
Methyl	1:20	0.46
Ethyl	1:30	1.00
Propyl	1:70	3.05
Butyl	1:175	9.40
Amyl	1:450	28.85
Hexyl	1:1000	73.98
Heptyl	1:2500	210.76

The toxicity of the alcohols as measured by their antiseptic, germicidal, physiological, and narcotic actions has been observed and measured with use of bacteria, yeast cells, plants, and a wide variety of small animals. Von Oettingen[12] collected the available data in a 1943 publication. The apparent variations of the toxicities in the many reports seem to depend upon such factors as the species studied, the method of administration of the alcohol, the rate of its absorption, and its metabolic rate and fate. However, there is relative agreement with the general principles listed above; namely, (*a*) primary alcohols are usually more toxic than secondary and secondary more so than tertiary, (*b*) toxicity increases with molecular weight, and (*c*) normal alcohols are more toxic than the iso compounds with the same molecular weight.

Williams[13] recorded that the molecular configuration of alcohols tended to determine their metabolic fate. Primary alcohols can be excreted unchanged, or oxidized to aldehydes and

then to the corresponding fatty acids. Secondary alcohols can be excreted unchanged, conjugated with glucuronic acid, or oxidized to ketones. Tertiary alcohols oxidize with difficulty and so are excreted unchanged or as glucuronides.

The Chemistry of the Alcohols*

The homologous series of alcohols, ROH, is characterized by the presence of the hydroxyl (–OH) group. The alcohols may be considered as hydroxyl derivatives of hydrocarbons or as alkyl derivatives of water (HOH). The saturated open-chain alcohols have the general formula $C_nH_{2n+1}OH$ and are the end products of the reduction of acids ($C_nH_{2n}O_2$) by way of aldehydes or ketones ($C_nH_{2n}O$). The higher members resemble hydrocarbons. The lower members are similar to water, in which they are completely miscible, and, like water, form compounds of alcohol of crystallization analogous to water of crystallization, e.g., $CaCl_2 \cdot 4C_2H_5OH$.

Alcohols are identified by three systems of nomenclature. The first method identifies the alkyl radical and adds to it the word *alcohol.* The series then becomes methyl alcohol, ethyl alcohol, propyl alcohol, and butyl alcohol. This method is often applied to the alcohols up to 12 carbons. Since there is some reluctance to associate the word alcohol with a poisonous product, methyl alcohol is sometimes excluded from the series when it is named in this manner. It can be identified as methanol or wood alcohol.

The second method considers alcohols as derivatives of the simplest alcohol, methanol or carbinol, CH_3OH. The first members of the series are then carbinol, methyl carbinol, ethyl carbinol, *n*-propyl carbinol, and isopropyl carbinol. This method is particularly advantageous when more than one hydrogen of carbinol is substituted by alkyl groups forming secondary or tertiary alcohols. Dimethyl carbinol, isopropanol, is the simplest secondary alcohol. Methyl ethyl carbinol and trimethyl carbinol are readily identified as secondary butyl alcohol and tertiary butyl alcohol. Because the word carbinol implies a carbon, the total number of carbons in an alcohol, when named by this system, is one more than the sum total of carbons in the identified radicals. This system does not have much general use.

The third method of nomenclature is the Geneva system in which the terminal *e* of the parent hydrocarbon is replaced by *ol,* thus forming methanol, ethanol, propanol, and butanol. As with other homologous series, internal location of the functional unit, side chains, and unsaturation are designated numerically.

The terms *primary, secondary,* and *tertiary* when applied to alcohols denote structural configuration. A primary alcohol has the functional hydroxyl unit at the end of the chain and contains the radical $-CH_2OH$ to which one alkyl group is attached, except in methanol when a hydrogen replaces the alkyl group. Upon oxidation, primary alcohols form aldehydes and then acids with the same number of carbon atoms. A secondary alcohol has the hydroxyl unit located internally in the chain and contains the radical =CHOH to which two alkyl groups are attached. Upon oxidation, secondary alcohols form ketones and then acids with fewer carbon atoms than the original alcohols. A tertiary alcohol contains the radical ≡COH to which three alkyl groups are attached. Tertiary alcohols resist oxidation, forming neither aldehydes nor ketones; but if the oxidizing agent is strong enough, the molecular structure is broken, forming several oxidation products. Oxidation of alcohols with the formation of characteristic products is one of the reactions used to identify their structures.

Isomerism of alcohols is frequent, and is of two types. One type is derived from different locations of the hydroxyl group in the chain as in normal (*n*) propanol and isopropanol. The first is a 3-carbon alcohol with the functional unit on the end carbon (a primary alcohol), and the second has the functional unit on the second carbon (a secondary alcohol). The second type of isomerism results from branching of the parent hydrocarbon from which the alcohol is derived. Normal alcohols are straight-chain primary alcohols. Iso-alcohols are branched-chain primary alcohols, except isopropyl alcohol. The use of the terms secondary and tertiary aids in the clarification of the structure of the alcohol when the precise Geneva system is not used. Some of these relationships are shown in Table IV. The number of possible isomers increases with additional carbons: C_2 to C_8 have 1, 2, 4, 8, 17, 39, and 89 isomers, respectively.

In physical form the lower members are colorless, mobile liquids; the middle members are oily; and the higher members are solids with a wax-like appearance at C_{12} and above.

The first three members are completely soluble in water but the higher members be-

*The chemical information used throughout this review was obtained from Fieser and Fieser[14] and Mellan.[15]

Table IV—Relationship of Formula Nomenclature and Type of Alcohol.

Graphic Formula	Nomenclature			Type
	Common	Carbinol	Geneva	
C–C–C–C–COH	*n*-amyl	butyl	1-pentanol	P
C–C–C–COH C	active amyl	*sec*-butyl	2-methyl-1-butanol	P
C–C–C–COH C	isoamyl	isobutyl	3-methyl-1-butanol	P
C C–C–CH_2OH C	neopentyl	*tert*-butyl	2,2-dimethyl-1-propanol	P
OH C–C–C–C–C	*sec*-active amyl	methyl propyl	2-pentanol	S
OH C–C–C–C–C		diethyl	3-pentanol	S
C–C–C–C C OH	*sec*-isoamyl	methyl isopropyl	3-methyl-2-butanol	S
C C–C–C–C OH	*tert*-amyl	dimethyl ethyl	2-methyl-2-butanol	T

come progressively less soluble rapidly. The straight-chain C_4, C_5, and C_6 compounds are water-soluble in the percentages of 7.7, 2.4, and 0.58 by weight. Solubility also varies with structure. Isobutyl alcohol is more soluble than *n*-butyl alcohol and tertiary butyl alcohol is completely water soluble.

The boiling points of the straight-chain primary alcohols increase regularly in an increment of about 20°C for each additional carbon. An exception is the 14°C difference in boiling points between methyl and ethyl alcohols. The first member of a homologous series often has physical and physiological properties different from those which would be predicted by observing the other members of the series. Internal location of the hydroxyl group and branching of the chain lower the boiling point. For example, the whole number boiling points of the butanols are 117, 107, 99, and 82 for *n*-butyl alcohol, isobutyl alcohol, secondary butyl alcohol and tertiary butyl alcohol.

Many polyfunctional alcohols are known. Monohydric compounds are called alcohols; dihydric compounds, glycols; and trihydric compounds, glycerols. Alcohols with three or more hydroxyl groups are known as polyhydric alcohols of which tetrahydric, pentahydric, and hexahydric compounds have been isolated. The monohydric alcohols, particularly the reactive, low molecular weight members, do not occur free in nature but are found combined with organic acids as esters from which they are released by hydrolysis.

Unsaturated alcohols of the ethylenic (C=C) and acetylenic (C≡C) series are known and a few have importance. The two carbon members CH_2=CHOH, vinyl alcohol, eth*enol*, and CH≡COH, eth*ynol*, are too reactive to be isolated but may be reaction-active isomers of acetaldehyde and ketene. Likewise, 1-propenol, CH_3CH=CHOH, and 2-propenol, CH_3COH=CH_2, with the hydroxy group attached to an unsaturated carbon, do not exist naturally. However, the isomer 3-propenol (allyl alcohol, vinyl carbinol, CH_2=CH CH_2OH) is a valuable reactive alcohol having great commercial importance and is produced in large quantities.

[To be concluded.]

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References

1. Fatty Alcohol Films and Water Evaporation Control, A. Food & Drug Officials United States 22:168 (Oct.) 1958.

2. Chemical Economics Handbook: VI, Stanford Research Institute, Menlo Park, Calif.: (*a*) Methanol—April, 1958; (*b*) Ethyl Alcohol—April, 1958; (*c*) Isopropyl Alcohol—Dec., 1958; and (*d*) Butyl Alcohols—Sept., 1959.

3. Nelson, K. W.; Ege, J. F.; Ross, M.; Woodman, L.

E.; and Silverman, L.: Sensory Response to Certain Industrial Solvent Vapors, *J. Indust. Hyg. & Toxicol.* 25:282, 1943.

4. Silverman, L.; Schulte, H. F.; and First, M. W.: Further Studies on Sensory Response to Certain Industrial Solvent Vapors, *J. Indust. Hyg. & Toxicol.* 28:262, 1946.

5. Threshold Limit Values for 1959, *A.M.A. Arch. Indust. Health* 20:266, 1959.

6. Larson, P. S.; Finnegan, J. K.; and Haag, H. B.: Observations on the Effect of Chemical Configuration on the Edema-Producing Potency of Acids, Aldehydes, Ketones and Alcohols, *J. Pharmacol. & Exper. Therap.* 116:119, 1956.

7. Smyth, H. F., Jr.; Carpenter, C. P.; and Weil, C. S.: Range-Finding Toxicity Data, List IV, *A.M.A. Arch. Indust. Hyg.* 4:119, 1951.

8. Smyth, H. F., Jr.; Carpenter, C. P.; Weil, C. S.; and Pozzani, U. C.: Range-Finding Toxicity Data, List V, *A.M.A. Arch. Indust. Hyg.* 10:61, 1954.

9. Smyth, H. F., Jr.: Personal Communication to the author.

10. Welch, H., and Slocum, G. G.: Relation of Length of Carbon Chain to the Primary and Functional Toxicities of Alcohols, *J. Lab. & Clin. Med.* 28:1440, 1943.

11. Stiles, W., and Stirk, M. L. L.: Studies on Toxic Action: IV. The Relative Toxicities of Isomeric Alcohols of the Aliphatic Series, *Protoplasma* 16:79, 1932.

12. von Oettingen, W. F.: The Aliphatic Alcohols: Their Toxicity and Potential Dangers in Relation to their Chemical Constitution and their Fate in Metabolism, Washington, D.C., U.S. Public Health Service Bulletin No. 281, 1943.

13. Williams, R. T.: Detoxication Mechanisms, Ed. 2, New York, John Wiley & Sons, Inc., 1949.

14. Fieser, L. F., and Fieser, M.: Organic Chemistry, Boston, D. C. Heath & Co., 1944.

15. Mellan, I.: Source Book of Industrial Solvents: Vol. III. Monohydric Alcohols, New York, Reinhold Publishing Corp., 1959.

THE 20TH ANNUAL CONGRESS ON INDUSTRIAL HEALTH

will be held

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Hotel Charlotte, Charlotte, North Carolina

The Congress is held annually by the Council on Industrial Health of the American Medical Association. Cooperating organizations for this 20th annual meeting are: The Medical Society of North Carolina; The Mecklenburg County Medical Society; The Governor's Council on Occupational Health; The Greater Charlotte Occupational Health Council, and The Society for the Advancement of Management. The scientific program includes the following:

Monday the 10th—"History and Problems in Occupational Medicine in North Carolina"—Amos N. Johnson, M.D., President, Medical Society of State of North Carolina; "Occupational Health Programs: Meaning, Scope and Contents"—Lemuel C. McGee, M.D., Medical Director, Hercules Powder Company; "Occupational Health in Agriculture"—Franklin H. Top, M.D., Professor and Head, Department of Hygiene and Preventive Medicine, College of Medicine, State University of Iowa; "Health Hazards from Ionizing Radiation"—Charles L. Dunham, M.D., Director, Division of Biology and Medicine, U.S. Atomic Energy Commission.

Tuesday the 11th—"What Management Expects of an Occupational Health Program"—N. H. Collisson, Vice-President, Olin Mathieson Corporation; "Occupational Health Problems in Small Employee Groups"—a panel discussion with Charles F. Shook, M.D., Medical Director, Owens-Illinois Corporation, as Moderator; "Mental and Emotional Health in Industry"—a panel discussion with Ralph T. Collins, M.D., Consultant in Neurology and Psychiatry, Eastman Kodak Company, as Moderator; "When Should My Patient Return to Work?"—a panel discussion with William B. Townsend, M.D., Esso Standard Oil Company, as Moderator.

Wednesday the 12th—"Professional Relationships in Industrial Practice"—Melvin N. Newquist, M.D., Consultant in Occupational Health, and MacRoy Gasque, M.D., Medical Director, Ecusta Paper Corporation; "Acute Trauma"—Walter S. Hunt, Jr., M.D., Orthopedic Surgeon; "Diagnostic Problems in Toxicology (Agriculture)—Wayland J. Hayes, Jr., M.D., Chief, Toxicology Section, Public Health Service Communicable Disease Center; "Problems in Dermatitis in Farm and Industry"—Donald J. Birmingham, M.D., Medical Director, Chief, Dermatologist, Public Health Service Occupational Health Program.

Further information may be obtained from the Council on Industrial Health, American Medical Association, 535 North Dearborn, Chicago 10, Illinois.

INDUSTRIAL TRAUMA

III. Abdominal Injuries

James C. Drye, M.D., Louisville, Ky.

MORTALITY due to abdominal injuries is high, although such injuries account for only a small percentage of the total number of injuries. They do, however, occur often enough to be of importance. Zollinger[1] reported an incidence of only 4 cases in 724 consecutive patients brought to a city hospital emergency room; 3 of these 4 patients died. The mortality is related to the severity of the abdominal injury and to concomitant injury, but all too often it is due to delay or to erroneous diagnosis.

Abdominal injuries are due to either blunt or penetrating trauma. Those due to penetration may be further subdivided into simple penetrations, without a wound of exit; perforating injuries, in which there is a wound of entrance and a wound of exit; and impaling injuries.

The philosophy of the surgeon in dealing with possible abdominal injury must be almost the exact opposite of that when he is dealing with elective surgical problems. In the latter case the surgeon generally operates only when there is a demonstrable pathologic condition present.

In dealing with a suspected abdominal injury he must operate unless he can exclude the possibility of injury with a high degree of certainty. The fatality rate for missed or overlooked intra-abdominal injuries is high.[2] A negative exploration, carrying a negligible risk of mortality, is a small price to pay to avoid the mortality which will occur in cases of overlooked injury.

The decision to operate should be made early. One should not wait for the appearance of the signs of the "acute abdomen," such as spasm and tenderness. These are the signs of peritonitis, and they occur late in cases of injury.

Of importance secondary only to the diagnosis of the presence of an intra-abdominal injury is a definitive diagnosis of which organ is injured. This may be of real help at times in the management of these cases, but attempts to make an accurate organ diagnosis should not be carried to the extent that the patient is allowed to deteriorate.

As in other trauma cases, therapeutic and diagnostic measures are carried along at the same time. The following discussion of various therapeutic and diagnostic measures must, of necessity, be presented in some order; in actual practice, however, many of them are carried on concomitantly and the order in which they are presented here is not necessarily the order in which they should be performed in the individual case.

It is important in all cases of trauma that all clothing be removed and the patient carefully inspected from the top of his head to the bottom of his feet for evidence of multiple injuries. It is of particular importance to look at the back as well as the front of the patient. A painful obvious injury may cause one to overlook a potentially more lethal but more obscure injury.

In cases of penetrating and perforating wounds of the abdomen the wound of entrance should be carefully located and the wound of exit, if present, should be carefully noted. By projecting lines between these two wounds an idea can be gained as to which organs may have been injured. In cases of penetrations by bullets or other radiopaque foreign bodies, a line mentally projected from the wound of entrance to the location of the foreign body will give a good indication of which organs may be injured. It is much easier to visualize mentally the possible damage in cases of injury due to bullets and other opaque material than in the cases of wounds due to a knife, an ice pick, or the like. It must be remembered that in such wounds, regardless of the location, the penetration can have extended in any direction and will extend as far as the length of the wounding in-

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strument. A wound in the epigastrium may reach the heart; or, on the other hand, it may reach down into the pelvis. Likewise, either a penetrating or a perforating wound that has a chest wall entry may reach into the abdomen.

In cases of blunt trauma it is important to look for areas of abrasion and contusion, but one should not forget the contrecoup type injury in which the spleen can be injured from a blow on the right and the liver injured by a blow on the left.

A large intravenous needle, 17-gauge or larger, should be inserted into one of the arm veins, preferably below the elbow and well out of the antecubital space. These patients are frequently moved about, and a needle placed in the antecubital space is frequently dislodged. At the time of the venepuncture blood can be obtained for typing and cross matching, and administration of saline can be started. If dextran or other plasma expanders are to be used, it is important that blood be drawn for typing and cross matching before these are given, since they sometimes interfere with the accurate cross matching of the blood.

All patients should have their stomachs intubated with a nasogastric tube and the contents aspirated. This will tend to prevent aspiration during induction of anesthesia and may also give some diagnostic help if blood is found in the stomach. Likewise, all such patients should have a catheterized urine specimen. This not only will help the operation by emptying the bladder but also may give diagnostic help if blood is found. If the catheter cannot be passed, a urethral injury should be strongly suspected. If the urine obtained is grossly bloody, it usually means that there is a wound of the bladder. Microscopic blood means, as a rule, hemorrhage occurring higher up.

Rectal examination may at times be very helpful. If the wound is low in the abdomen, blood may be noted on the examining finger. If there is a strong suspicion that the lower sigmoid or rectum has been injured, sigmoidoscopy may be of value.

The methods of resuscitation used have been outlined in a previous review in this series; they will not be discussed here.

In general, probing of wounds is to be discouraged. In some cases in which there is a question as to whether perforation of the abdomen has occurred, the patient may be taken to the operating room, the abdomen prepared as for a major laparotomy, and the tract explored under local anesthesia. If penetration can be ruled out by this method, it is a simple matter to debride the wound and close it. If the wound goes into the abdomen, the patient is then anesthetized and a formal laparotomy carried out.

Vertical incisions, either midline or paramedian, are much superior to transverse incisions. These vertical incisions are quickly and easily made, are easier to close, and give excellent exposure. Further, if colostomies or drainage incisions are found to be necessary, it is much easier to avoid getting them close to the primary incision than it is with transverse incisions. Good exposure is necessary, and the incision should be long enough to afford such exposure. In general, the ability of the surgeon is directly proportional to the length of the incison. Small incisions and transverse incisions should be avoided. In a study reported several years ago by Hamilton[4] it was found that the evisceration rate for transverse incisions was some four times that for vertical incisions in *trauma* cases.

Three methods of closure may be used: simple through-and-through, through-and-through plus a layer closure, and simple layer closure. In cases in which the incisions are long and in which there is much contamination, either the through-and-through or the through-and-through plus a layer closure is preferable. One of these is also the preferable type of closure in patients who are alcoholic, who are psychotic, or who are debilitated. Through-and-through closure is also used in extremely bad risk or critical patients. The through-and-through closure plus a layer closure has been advocated by Pemberton, of the Mayo Clinic, for many years. In the World War II experience of the Second Auxiliary Surgical Group[5] a through-and-through plus a layer closure was attended by far the lowest rate of eviscerations. These occurred in severely wounded soldiers who had had extensive contamination of the peritoneal cavity and in whom long incisions had been made. The technic of this type of closure has been described most recently by Thompson and Lewis.[5]

If blood is encountered when the abdomen is opened, it is most important to search for continued active bleeding. The control of such bleeding should be of the highest priority. Hemorrhage when first found should be stopped by "the head and the fingers." Almost all active bleeding can be controlled by pressure. After such control, adequate exposure can be obtained and a definitive treatment of the hemorrhage done with safety. Wild clamping through a pool of blood is futile, and important viscera may be injured.

Wounds of Specific Organs

All wounds of the spleen require splenectomy. For traumatic injury to the spleen this is a relatively simply procedure. The assistant should put firm traction on the body of the stomach, pulling it downward to the right, and with his other hand retract the incision laterally and superiorly with a retractor. The operating surgeon simply separates the spleen posteriorly, and with continued traction on the stomach, the spleen will come up above the abdominal wall and the vessels can be clamped and ligated. Caution should be taken not to include a portion of the wall of the stomach in the clamps. In many cases the tail of the pancreas may be injured; when this has occurred it may be wise to put drains in posteriorly and bring them out through the flank.

Our experience with wounds of the liver has been considerably different from that observed by the military surgeons. Madding[6] reported on 829 wounds of the liver in wartime surgery and found that 90% of them had quit bleeding at the time of operation and that hemorrhage was usually not a real problem. In civilian life, however, many such livers are bleeding actively and severely. The difference is due to the variation in length of time from the sustaining of the injury to the arrival of the patient in the operating room. In Madding's cases there was an average time lag of about six hours, and the patients with severe wounds who had bled badly undoubtedly had died before they reached the operating room. We frequently admit such patients in a matter of minutes.

Bleeding from relatively minor wounds of the liver may be controlled by a dry gauze pack left in place for a few minutes. It is convenient to do this until other injuries are repaired, but these packs should not be left in place very long.

At the present time there seems to be no good answer to the question of the treatment of hemorrhage from the extremely badly shattered livers resulting from blunt trauma that are occasionally seen. In some of these cases there is almost dissolution of liver tissue, and our attempts to stop hemorrhage in these cases have generally been futile. In knife wounds and bullet wounds the hemorrhage may not be such a difficult problem. Packing of the liver should be avoided if at all possible. This leads, as a rule, to infection followed by secondary hemorrhage about the sixth day. The sheet anchor in treatment of liver wounds is adequate drainage. Five or six Penrose drains should be distributed around the site of injury and above and below the liver and brought out through a good-sized stab wound in the flank.

Wounds of the stomach are treacherous. It is not enough to invert the wound with a series of stitches. A layer of hemostatic sutures including all layers of the stomach wall must be laid down. Otherwise, hemorrhage will take place postoperatively. After the hemostatic layer of sutures is used, the wound can then be inverted by interrupted serosal stitches.

It should be remembered in all cases of bullet wounds that an even number of holes should be found, or, very rarely, and uneven number with a bullet lying inside the luminal viscera. Overlooked perforations are fatal. This applies in wounds of the stomach. Both the anterior and the posterior surface of the stomach must be visualized.

Wounds entering the lesser peritoneal sac and those about the head of the pancreas are particularly dangerous. All too frequently there is a wound in the retroperitoneal portion of the duodenum. Wounds in this area require that the duodenum be fully mobilized and its posterior aspect examined. If there is a perforation, it must be closed; overlooked wounds of the duodenum are invariably fatal.

Wounds of the small intestine are fairly easily managed. If there are a number of multiple wounds along a short segment, it is better to resect the injured segment and do a primary end-to-end anastomosis. More scattered wounds of perforation may be simply closed.

Wounds of the colon were handled in World War II almost exclusively by exteriorizing procedures, but this is not necessary in all cases in civilian life. Primary closure of wounds should be done only in those cases in which there is little or no contamination, in which the blood supply is good, and in which the wound is not extensive.

Simple perforating wounds of the right colon may be handled by closure of the posterior wound and placement in the anterior wound of a catheter which is brought out through a separate stab wound through the abdominal wall. If there is too much destruction of the colon or if there is a large amount of contamination, it is probably best to resect the right colon and do a primary end-to-end enterocolostomy. If the right colon is exteriorized, it acts almost as an ileostomy and may cause much postoperative difficulty.

Wounds of the transverse and descending colon are most safely handled by exteriorization, and in cases of doubt this should be done. Many of these wounds, however, can be handled by simple closure. Again it must be emphasized that simple closure should be done only in those cases with minimal contamination and with a

good blood supply and in which there is not extensive damage. If simple closure is not done, the injured part of the colon should be freely mobilized and brought out as a loop colostomy over a glass rod, through a separate incision.

Wounds of the rectum and rectosigmoid below the line of peritoneal reflection should be treated by proximal diversionary colostomy and drainage from below. The drainage from below is accomplished by making a horseshoe incision around the posterior aspect of the anus and breaking into the retrorectal space. This is drained by multiple Penrose drains. It is not necessary to close the perforation in these cases, although it may be done if convenient. Posterior drainage and the proximal diverting colostomy are mandatory. If simple closure is attempted, the mortality is high, owing to the spread of infection through a plane of areolar tissue which extends up over the posterior aspect of the abdomen and into the chest. An infection in this area is highly fatal.

Wounds of the bladder are best treated by closure of the wound and establishment of suprapubic drainge. Delayed wounds of the bladder due to sharp bony fragments from fractures of the pelvis should be kept in mind. It may take several days for a sharp piece of bone to burrow through the bladder in cases in which there is a severe injury to the pelvis.

Wounds of the ureter are extremely rare. Whenever possible, they should be repaired primarily, fishmouthing the ends and approximating them. Only fine absorbable suture should be used for this. Ureterostomy should be made above the site of injury and brought out through a separate stab wound in the flank.

Wounds of the kidney are frequently overtreated, and kidneys are removed that should be conserved. The only real indication for a nephrectomy is a severe wound of the kidney pelvis and hemorrhage from the renal artery or one of its important branches. Wounds of the body of the kidney can be treated by a nephrostomy tube which is brought out through the flank and by adequate drainage. If this done, many kidneys can be saved. Adequate drainage of the injured kidney is a necessity.

Wounds of the pancreas are becoming more frequent with the change in design of the automobile steering wheel. Recessed steering posts and the enlarged rim lead to injuries in which the lower edge of the steering wheel rim is driven into the abdomen. We have seen several cases of pancreatic injury of this sort. Generally the pancreas is crushed between the rim of the steering wheel and the vertebra. If the distal end of the pancreas is torn loose or badly injured, it may be excised and, if possible, closure of the stump of the remaining pancreas accomplished. Here again drainage is an absolute necessity. Adequate drainage should be established posteriorly with Penrose drains brought out through the flank.

Summary

The only predictable factor in abdominal injuries is that no case is accurately predictable. The surgeon who opens the traumatized abdomen must be prepared to handle any type of injury of any abdominal organ. A working knowledge of the principles of treatment of shock and resuscitation and of the management of injuries of all the abdominal organs is essential. For success in treating these injuries one must keep foremost in mind that the saving of life is of paramount importance. Complex, fancy, and time-consuming procedures are to be avoided.

There is great satisfaction in treating abdominal injuries. If the patient recovers, it is most probable that he well be a well man, with no sequelae. This is often not true of severe head and extremity injuries.

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References

1. Zollinger, R. W.: Traffic Injuries—A Surgical Problem, *A.M.A. Arch. Surg.* 70:694, 1955.

2. Oberhelman, H. A., and Le Count, E. R.: Penetrating Bullet Wounds of the Abdomen, *Arch Surg.* 32:373, 1937.

3. Hamilton, J. E., and Duncan, E.: Penerating Gunshot and Stab Wounds of the Abdomen, *Surgery* 13:107, 1943.

4. Swingle, H. F., and Condie, D. S.: Laparotomy Incisions and Closures, and Wound Dehiscences, in Surgery in World War II, 1955, Vol. 2, pp. 191-196.

5. Thompson, M. D., and Lewis, B.: An Attempt to Prevent Disruption of Abdominal Wounds, Transactions of the Southern Surgical Association, to be published.

6. Madding, G. F.; Lawrence, K. B., and Kennedy, P. A.: Wounds of the Liver and of the Extrahepatic Biliary Tract (829 Casualties), 1955, Vol. 2, pp. 275-284.

Outline of a Disaster Control Plan for Industry

Committee Report

IN-PLANT or community disasters such as explosion, fire, tornado, earthquake, flood, wrecks, or thermonuclear attack may suddenly create an overwhelming number of casualties. With relatively few exceptions, however, industrial medical departments appear to have given little thought to preparedness for rendering adequate medical care under extreme emergency conditions. Planning for the management and care of mass casualties is our responsibility. The following plan formulates an organization readied for instant activation in the event of a major disaster. Its purposes are to (1) prevent or lessen threat to life and limb; (2) minimize property damage; (3) expedite resumption of necessary activities.

The plan is drawn in skeleton form so that it may be modified in accordance with the particular environment of the industrial unit. The problems to be anticipated and the methods for their solution will differ considerably between an industry located in a metropolitan area, with numerous and well-stocked hospitals and neighborhood facilities, and one in a small urban setting dependent completely upon its own resources in the immediate postdisaster period. It must be kept in mind, however, that even in the metropolis, civil facilities may be taxed and unable to offer assistance, or evacuation of communities may require reception of the injured and homeless by industrial installations.

Medical and allied personnel will be only one of several groups set to function immediately in a catastrophe. It may be necessary to seek help from local units of the police and fire departments and civil defense. Drills under simulated conditions should be held to test the plan and to weld all units into an efficient operation.

The Emergency and Disaster-Control Committee hopes this outline will serve to stimulate thorough planning to minimize the toll in disaster situations.

Disaster-Control Unit Organizational Chart

Advisory Committee

	Name	Telephone Business	Residence
Chairman			
Alternate Chairman			
Members			

Functions—

1. Establish liaison with company management.
2. Develop overall policies.
3. Inspect and review established procedures.

Executive Committee

Chairmen of the Advisory Committee and of the four Standing Committees: Communications and Public Information, Equipment and Plant Emergency Systems, Traffic Control, Medical Care.

Functions—

1. Designate a Disaster Chief and alternates empowered to put the Disaster Control Plan into operation, to supervise all activities of the organization from the Control Center, and to receive and channel all reports and requests. Alternate Control Centers should be designated in event of damage to original site.
2. Formulate specific plans to meet various types of anticipated disasters.
3. Coordinate the Standing Committees; request and review written operating plans of each committee and its subdivisions.
4. Appoint department representatives as necessary.
5. Establish liaison with outside agencies.
6. Review plans and preparedness status in periodic meetings; evaluate changing conditions.

Communications and Public Information Committee

	Name	Telephone Business	Residence
Chairman			
Alternate Chairman			
Members			

Functions—

1. Designate a Central Reporting Station on 24-hour basis to receive and relay word of emergency to Disaster Chief or his alternate, and upon the latter's instructions, to place in force the Disaster Control Plan.
2. Man the Control Center under orders of the Disaster Chief.
3. Formulate messages to be transmitted to personnel required to meet emergency situations.
4. Transmit authorized messages to outside agencies.
5. Maintain facilities to transmit messages, with alternate facilities in event of disruption of usual channels, e.g. mobile two-way radio equipment, public address systems, sound trucks. Maintain battery radios marked with Conelrad Channels 640 and 1240, which may be the only source of outside information in a major catastrophe. List all such equipment.
6. Release information to public as authorized. The Disaster Chief or his alternate should be the only one authorized to furnish information for public release, to prevent undue confusion and possible hysteria. Members of the press should be treated courteously, but the details of an emergency should be furnished them only by personnel so authorized.
7. Educate the personnel—and the public, where in-

The above report was prepared by the Industrial Medical Association's 1959-1960 Committee on Emergency and Disaster Planning (Max N. Howard, M.D., Chairman; Herman J. Bennett, M.D.; John W. Borino, M.D.; Norvin C. Kiefer, M.D.; and William N. Young, M.D.).

dicated—in the overall plans in event of a major disaster.

Equipment and Plant Emergency Systems Committee

	Name	Telephone Business	Residence
Chairman			
Alternate Chairman			
Members			

Functions—

1. Conduct plant survey and list fire, safety, and mechanical equipment; maintain such equipment.
2. List with day and night telephone numbers those persons authorized to request, release, and man such equipment.
3. Instruct all members in their assigned stations and duties.
4. Review adequacy of equipment to determine possible need of outside assistance. Ancillary equipment should be listed in detail with names of persons to be reached and their telephone numbers both day and night.

Traffic Control Committee

	Name	Telephone Business	Residence
Chairman			
Alternate Chairman			
Members			

Functions—

1. Control all traffic on, into, and out of plant property during an emergency.
2. Coordinate efforts with police agencies.
3. Establish road blocks and detour traffic as required during emergencies.
4. Permit authorized persons to pass road blocks into plant. Furnish key personnel with identification by personal and vehicular cards, armbands, or stickers.
5. Maintain and distribute up-to-date maps indicating road blocks and detours and revise as necessary.
6. List personnel and equipment for effective traffic control in plant; designate individual stations and reporting areas.

Medical Care Committee

	Name	Telephone Business	Residence
Chairman			
Alternate Chairman			
Members			

Functions—

1. Establish procedures for first aid at scene of emergency.
2. Establish various locations suitable for reception and care of injured personnel evacuated from the emergency area.
3. Establish procedure for alerting supporting hospitals. Only one person should be authorized to transmit such information to prevent false alarms and unnecessary confusion.
4. Coordinate transportation of injured.
5. Evaluate medical supplies, equipment reserve pools, and availability of utilities.

Amplification of Medical Care Plan

Professional Personnel

	Name	Emergency Station	Telephone Business	Residence
MEDICAL DIRECTOR				
ASSISTANT MEDICAL DIRECTOR				
TRIAGE OFFICER				
PHYSICIANS				
NURSES				
FIRST-AID MEN				
Squad Leader				
Members				
STRETCHER BEARERS				
Squad Leader				
Members				
NURSES' AIDES				
Squad Leader				
Members				

Procedure—The plant physician or person in authority will institute standard operating procedures as indicated and activate plans through established channels. He will evaluate situation as to

1. Number of injured.
2. Types of injury.
3. Number of injured transportable.
4. Medical personnel needed immediately at site.
5. Special medical supplies needed.

Transportation Facilities for Wounded

1. Stretchers .....numbers and location
2. Wheeled litters .....number and location
3. Ambulances .....manning personnel and capacity
4. Trucks available .....manning personnel and capacity (stretcher or sitting wounded)
5. Outside facilities with name, address, and telephone of persons or agencies to contact.

List of Medical Equipment Available

1. Medical Department—on hand.
2. Reserve supply.
3. Emergency chests suitable for transportation to disaster site or to collection area for injured. Such chests should be reserved for extreme emergencies only, and should be rechecked at six-month intervals. Suggested contents of emergency chests:

Alcohol—4 pt.
Antiseptic (Mercresin, etc.)—1 pt.
Plasma or substitute—2 units
3″ ace bandage—1 doz.
4 × 4 sponges—2 × 100
2 × 2 sponges—2 × 100
2 cc syringe—5
5 cc syringe—2
100 cc 1% procaine—1
Morphine ampins, grams ½—8
Suture material—1 can
2″ roller gauze bandage—1 × 90
Sterile cotton—2 × 2 oz.
Adhesive tape, mixed cut—1 tube
Sterile towels, packed in 3's—1 doz.
Sterile applicator sticks—1 pkg.
Needles—1 doz.
100 cc sterile water—1
Identification tags and red pencils—1 doz.
Adrenalin, caffeine, sodium benzoate
Instruments:
Thumb forceps
Mouse-toothed forceps
Retractors—2
Needle holder
Petrolatum gauze
Scissors and bandage scissors—2
Pontocaine solution—1 dropper bottle
Large ear bulb syringes—2
Splints—variety
Flashlight

4. Number and location of blankets, masks and can-

nisters, oxygen, resuscitators, protective clothing, radiological detection equipment.

5. Auxiliary medical equipment available in area with name, address, and telephone of persons or agencies to contact, and information as to whether material can be delivered or must be sent for.

Area Mapping of Physical Plant

1. First-aid stations—location with water, electricity, heat, and toilet facilities available.

2. Collection points for injured—accessibility and size of rooms; number of stretchers that can be accommodated; floor plans for types of cases, such as shock, burns, mechanical trauma; utilities available, and emergency sources of light and heat in event of power failure.

3. Flow of traffic—evacuation, disposition, recording and tagging of injured.

Special Requirements in Event of Thermonuclear Attack

It has been recommended that plans be made for self-maintenance for two weeks in the event of attack attended by radioactive fall-out.

1. Radioactive fall-out shelters—location and capacity.

2. Emergency food and water supplies—protection from contamination.

3. Provision for extended care of injured.

4. Housekeeping facilities.

5. Sanitation of plant area.

6. Disposition of dead.

EIGHTY-EIGHTH ANNUAL MEETING

of the

AMERICAN PUBLIC HEALTH ASSOCIATION

will be held

October 31 to November 4, 1960

Civic Auditorium, San Francisco, California

This meeting will bring together the largest gathering of public health specialists ever to convene on the West Coast. Major sessions will include an opening symposium on "Man and His Changing Environment," and a closing symposium on "Present Status and Future Directions of Work in Malignant Diseases." Two or more of the Association's 14 sections have developed joint sessions on the following topics: Genetics; Rehabilitation; Adolescent Development; Medical and Dental Public Programs for Children; Medical Group Practice; Occupational Health Service in Medical Care; Mental Health Services in Schools; Cardiovascular and Chronic Disease Problems; Poliomyelitis and Polio Vaccines; Envirnomental Health for Institutions; Water and Waste; Radiological Health; Food Protection; Community Mental Health Programs; Eye Health of Children; Noise as a Health Problem; Agricultural Chemicals; and Zoonosis and Comparative Epidemiology.

Further information may be obtained from BERWYN F. MATTISON, M.D., Executive Director, American Public Health Association, 1790 Broadway, New York 19, N.Y.

Case Report

Dimethyl Sulfate Poisoning by Inhalation

Ralph W. Haswell, B.Ch.E., M.D., I.M.D., Hartford, Conn.

DIMETHYL sulfate is an oily, colorless liquid with a slight, nondistinctive odor. Its vapor density is 4.35 (air = 1). The melting point is 26.8° C, vaporization begins at 50° C, and the boiling point is 188.5° C.[1]

Inhalation of dimethyl sulfate, with mild irritation initially, may result in serious and even fatal effects with secondary pneumonia and generalized intoxication. Permanent injuries of the eyes have been reported.[3, 6] Dimethyl sulfate has been classified as a serious hazard.[9, 10, 11] A fatal case at autopsy showed chief changes in the respiratory system with early bronchopneumonia and pulmonary edema in association with severe conjunctivitis, cerebral edema, loss of corneal epithelium, and cloudy swelling of the liver.[5] Another worker was reported to have developed respiratory catarrh, increased conjunctival secretion, some chronic bronchitis, emphysema, and hypertrophy of the right ventricle, which was thought to be due to protracted exposure to dimethyl sulfate.[3]

There have been few cases of dimethyl sulfate intoxication reported in American literature, perhaps because of the relatively recent and limited use of the substance in our industry. Its earliest major use was as a methylating agent during World War I, when the dye industry was first organized to substitute for German imports. Known as *D-Stoff*, it was experimented with by the Germans as a possible war gas owing to its powerful vesicant property. It is absorbed through the skin and mucosa, digestive tract, and by inhalation. Reports of intoxication primarily from the cutaneous absorption have been published.[2] Blisters and corrosion of the skin result with the typical systemic involvement. Cases of poisoning from ingestion have been recorded.[3, 4] In one patient the immediate cause of death was edema of the glottis.[4] Inhalation is the most rapid route of absorption and is sometimes overlooked.

The occurrence of cases due to lack of use of respiratory protection has been noted.[5, 6, 7] The following acute case illustrates that, although under ordinary conditions the volatility is low, when the liquid becomes heated there is hazardous volatilization.

An experienced pipefitter was assigned the task of replacing a Hamer line blind in a pipe that normally carried dimethyl sulfate. Although the line had been drained, some of the material had become pocketed. When the pipe was opened, this dripped onto a covered steam line and evaporated. Prior to starting the job the worker had donned an acid (splash) hood and other protective clothing to prevent skin contact with the liquid. The likelihood of a vapor exposure had not been foreseen, and the vapors generated by the heat of the steam line collected under the hood which was open at the bottom.

Approximately 10 hours after exposure the pipefitter developed burning of the eyes with lacrimation, difficulty in swallowing, coughing, and a feeling that his throat was closing up. He was brought into the plant medical department by his son. On examination it was noted that he was extremely apprehensive. There was rhinorrhea, and the soft palate and uvula appeared edematous. The eyelids were markedly edematous, and the conjunctivae moderately injected. The pupils were slightly constricted. On auscultation the chest was clear, and it was resonant. The exposure history was learned from the employee, and he was hospitalized immediately.

His oral temperature on admission was 100° F, pulse rate 80, and respirations 22. Therapy with corticotropin (ACTHAR) gel, massive doses of penicillin, and an oxygen tent were instituted. A tracheotomy unit was placed at his bedside. Ophthalmologic cortisone and pontocaine were administered frequently.

The total white blood cell count was 32,500, with 83% polymorphonuclears, 13% unsegmented forms, and 4% lymphocytes. The hematocrit was 46, and the hemoglobin 14.4 gm. The urinalysis values were normal, and the blood urea nitrogen was 32 mg. %.

During the next week the patient exhibited signs of marked irritation of the surfaces of the respiratory tract and the eyes. Diagnoses of acute pharyngolaryngoedema, infectious pharyngitis, and pneumonitis were made. Photophobia, blurring of vision, hoarseness, and sore throat developed. The uvula became partially necrotic, and there was some sloughing. All of the laboratory values returned to normal, and the pneumonitis resolved. The symptoms gradually subsided and the patient was discharged 40 days after admission.

Because of persistent subjective pulmonary complaints, pulmonary function studies were carried out about two months after exposure. The findings suggested that there was residual disability of the order of 25%, due essentially to limitation of in-

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spiration. It was believed that the apprehension about lung filling was similar to that reported in cases of phosgene poisoning and accounted for the erratic findings which could be dispelled in part by reassurance.[8] Apparently in these cases there is a period when the tidal volume is severely limited and the patient has to relearn his potential for inspiratory capacity. A perforation of the nasal septum had developed, and this required surgical correction. An examination of vision three months after injury revealed no objective signs of optic nerve involvement, and the peripheral fields were within normal limits. Central visual acuity had not been affected by the accident. The patient returned to work three and one-half months after the injury.

Summary

A case of dimethyl sulfate poisoning with good recovery is presented. Serious features of the case included persistent limitation of inspiratory excursion, from which there was good recovery, and perforated nasal septum, for which surgical repair was successful. Cortisone, both systemic and ophthalmologic, in addition to oxygen and antibiotics, was felt to be efficacious in preventing serious pneumonitis and permanent visual impairment. So far as can be determined, this is the first report of the occurrence of perforation of the nasal septum or the therapeutic use of cortisone in this condition.

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References

1. Patty, F. A.: Industrial Hygiene and Toxicology, New York Interscience Publishers, Inc., 1949.
2. Littler, T. R., and McConnell, R. B.: Dimethyl Sulfate Poisoning, *Brit. J. Indust. Med.* 12:54, 1955.
3. Bartalini, E.; Mariani, L.; and Vaggi, L.: Dimethyl Sulfate Poisoning, *Med. lavoro* 48:329, 1957.
4. Nida, S.: Fatal Edema of the Glottis Following Inflammation of the Upper Digestive Tract Due to Dimethyl Sulfate, *Klin. Wchnschr.* 24-25:633, 1947.
5. Roseman, R., and Grill, W.: Toxicology of Dimethyl Sulfate, *Zentralbl. Arbeitsmed. u. Arbeitsschutz* 2:72, 1952.
6. Mohlau, F. D.: Report of Two Cases of Dimethyl Sulfate Poisoning, *J. Indust. Hyg.* 2:238, 1920.
7. Nebelung, W.: Acute Dimethyl Sulfate Poisoning, *Arch. Gewerbepath. u. Gewerbehyg.* 15:581, 1957.
8. Winternitz, M. C.: Collected Studies on the Pathology of War Gas Poisoning, New Haven, Conn., Yale University Press, 1920.
9. Ghiringhelli, L.; Colombo, V.; and Montiverde, A.: Observations on the Toxicity of Dimethyl Sulfate in Animal Experiments, *Med. lavoro* 48:634, 1957.
10. Carpenter, C. P.; Smyth, H. F., Jr.; and Pozzani, U. C.: The Assay of Acute Vapor Toxicity, and the Grading and Interpretation of Results on 96 Chemical Compounds, *J. Indust. Hyg. & Toxicol.* 31:343, 1949.
11. Threshold Limit Values for 1959, *Indust. Hyg. Dig.* 23:11, (Oct.) 1959.

Information Please

The questions published in this column are edited versions of requests for information that have been received during recent months. The answers have been prepared by one or more competent authorities in the particular area covered by the question. Readers may address questions to the Editor.

QUESTION: *In doing routine blood cholinesterase activity determinations in personnel who are potentially exposed to phosphate ester insecticides, isn't it sufficient to test for whole blood or serum cholinesterase as a measure of exposure rather than to perform the test on both plasma and erythrocytes?*

ANSWER: The response to exposure to these compounds as measured by decrease in enzyme activity varies somewhat with different insecticidal compounds. Also the degree of effect on enzyme activity in relation to time may be different for the plasma (pseudo) cholinesterase than for the erythrocyte (true) cholinesterase. This is borne out by experience with parathion, for example, in which the response to exposure is noted first in the plasma cholinesterase level before being demonstrated in the erythrocyte cholinesterase level. In addition, the rate of recovery from depression of enzyme activity following parathion exposure is faster in plasma than is seen in the erythrocytes. Where serial values of enzyme activity are plotted against time, two different curves are thus obtained. With experience and the use of simultaneous values (plasma and erythrocytes), one can easily determine the relative magnitude and time of exposure, whether exposure is continuing and to what degree, and what the status of enzyme recovery may be.

QUESTION: *In the antidotal treatment of cyanide poisoning, the present standard treatment includes the use of intravenous sodium nitrite followed by intravenously administered sodium thiosulfate. Since each of these therapeutic agents has an established antidotal effect, is their combined use merely an additive effect?*

ANSWER: No. To aid the detoxification mechanism, sodium nitrite is given to form methemoglobin which competes with cytochrome oxidase for cyanide ion, forming cyanomethemoglobin. The cyanide ion is gradually released from the latter and is converted in the liver to thiocyanate. The sodium thiosulfate is given as a readily available source of sulfur to aid the latter reaction. When Chen et al. (Chen, K. K.; Rose, C. L.; and Clowes, G. H. A: The Modern Treatment of Cyanide Poisoning, J. Indiana M. A. 37:344 [July] 1944) studied the relative effectiveness of antidotal agents in cyanide poisoning in the dog, they found that sodium nitrite alone protected against four lethal doses and sodium thiosulfate alone protected against three lethal doses, whereas the combination of the two detoxified twenty lethal doses.

Industrial Medical Association

THE PRESIDENT'S MESSAGE

ROBERT E. ECKARDT, M.D.

RECENTLY I have received reports of studies by two of our members in widely separated areas of the country* and have had the pleasure of hearing a scientific presentation at a component society meeting,† all of which contribute substantially to an understanding of the problem of industrial medical services for small plants.

All of these studies confirm the well-known fact that the majority of business enterprises in the United States are small business. What is, perhaps, surprising in these reports is that the managers of small enterprises like these are interested in industrial medicine and what it has to offer, but are somewhat wary because they believe the costs of an industrial medical program will be prohibitive. Part of this wariness may be engendered by the fact that the only industrial medical departments they have seen are those maintained by large industries. One look at these clinics, laboratories, x-ray rooms, etc., would convince any small operator that this is not for his pocketbook.

Another interesting fact gleaned from these studies is that management is interested in a program that goes beyond what, in the California study, is called "compensation medicine." More and more management is realizing that all medical care costs are a cost of doing business, and are therefore convinced that the control of all medical care costs are of interest to them. They feel that an industrial medical program should concern itself with all medical care costs. Paradoxically, the majority of physicians who do industrial work know little about, nor do they express much interest in becoming familiar with, a true industrial medical program. Rather the physicians' interest resides in more referrals of a "compensation medicine" type. It is not that "compensation medicine" is not a distinct and essential part of an overall industrial medical program; but it is only *one* facet of such a program. Yet it seems to be the only facet that the majority of physicians are interested in.

Significantly, what industrial hygiene services are being received by small plants are being provided to them by their insurance carriers. Admittedly this is small in amount. Is it possible, however, that this might suggest a solution to the industrial medical problems of the small plant?

The Small Plants Committee of the Industrial Medical Association has been wrestling for many years with the problem of how best to provide, on an economic basis, industrial medical programs for the small plant. Some of our members have developed very comprehensive and successful programs for the small plants in their area. On occasions they have met with serious antagonisms and opposition from the organized general medical profession in their area. How best, then, can we develop in the general medical profession the interest in this problem? How can we convey to our associates that industrial managements recognize the need but cannot seem to get the help they need from

*C. H. Hine, M.D., sent me a copy of Final Report: An Evaluation of Occupational Health Services and Needs in the City and County of San Francisco, Project 58-A-2, State of California, Department of Public Health.

Wilfred H. Sisk, M.D., sent me those sections of his state's plan for occupational health and radiological health resulting from his study of all the health activities of Florida.

†Sigel, G.: A Study of Forty Industrial Companies in Syracuse with References to their Usage and Needs with Regard to Industrial Medicine, delivered at the Spring meeting of the Western New York Society of Industrial Medicine and Surgery, Cooperstown, N.Y., June 4, 1960.

the general medical profession? It would seem that every member of our association might spread the word by *active* participation in their county medical societies, where the general medical profession can be made aware of these needs and urged to participate in their solution. Industrial medicine goes beyond medicine and surgery in industry. Industrial management has already apparently recognized this, but our associates in the practice of medicine and surgery are lagging behind. If the solutions are not found by the medical profession, management will then turn elsewhere for help. This is, perhaps, the most pressing problem for industrial medicine, and our Association, in the coming decade.

Book Reviews

FORENSIC MEDICINE. A. Keith Mant, M.D. Price, $8.50. Pp. 262. The Year Book Publishers, 200 E. Illinois St., Chicago 11, Ill., 1960.

This is a praiseworthy effort to present to the practicing physician some of the aspects of forensic medicine, particularly on-the-scene investigation, while avoiding insofar as possible the more technical aspects of forensic pathology. Extensive detail on late postmortem changes which can be properly evaluated only by the experienced forensic pathologist thus seems unnecessary. Perhaps the physician on the scene should only record facts and not attempt to estimate the time of death, rather than make an amateurish and misleading conclusion. Certainly in this country it is better that the physician on the scene leave the legal interpretation to the forensic pathologist.

Many of the case citations contribute no material and can be deleted. Those of significance could more appropriately be included with the illustrative photographs. Many of the black and white photographs have such poor contrast that few details are evident, and the result is often confusing. For example, the scalp is unshaved in Figure 57, and an exit wound is not discernible. Photographs of guns, bullets, shotgun cartridges, and knives are noncontributory.

Although some legal material is included, no mention is made of proper preservation and identification of medical evidence, or of the legal aspects of dying declarations. Considerable differences in statutory law exist in the various states, and American physicians should not be guided by the English law. For instance, in contrast to the law on abortion in England, Pennsylvania statute specifically states that no woman shall be convicted of having an abortion performed on herself. In Pennsylvania, therefore, a self-induced abortion is not illegal. Whereas English law is far more realistic in defining legal viability at 28 weeks, various states require stillbirth certificates as early as the fourth lunar month of gestation.

The material on infant deaths fails to provide a very important differentiation between a medical and a legal live birth. The fact that a child is born and breathes constitutes a medical live birth, but as a matter of law, there must be proof of an existence independent of the mother. A forensic pathologist can certify only to a medical live birth. Other evidence is essential to constitute a legal live birth. Differences of opinion certainly exist so far as overlaying and the allegedly asphyxial deaths of infancy. No book on forensic medicine should omit a discussion of apparently natural deaths in infancy due to undetermined causes, even after exhaustive studies have been made. About one-third of the deaths of infants under 12 months, more commonly the colored male under 6 months of age, dies with no adequate cause of death.

The chapter on poison gives an extensive list of barbiturates but makes no statement about tranquilizer drugs, although this is not an uncommon fad in suicides. No mention of poisonings in children is made, although such accidental poisonings are quite common in the United States, and physicians should be more aware of this problem, particularly lead poisoning, which not uncommonly results in death following a febrile and convulsive episode. Undoubtedly the problem of alcohol is not so acute in England as in this country, but it is still the most common poison dealt with medicolegally. In spite of the fact that a full chapter is devoted to carbon monoxide, virtually no mention of alcohol is made. This is important not only because of its frequent association with violence but also because of its lethal poisonous effects per se.

The devotion of an entire section to sexual offenses is extremely important for physicians. A notable oversight is made in failure to emphasize the importance at the initial examination of making smears for spermatozoa and of procuring material for acid phosphatase and other examinations for semen, to emphasize proper identification of the specimens and to stress the prohibition against the use of vaginal jelly in such examinations because of its spermicidal effect.

A great deal of information is concentrated in a very small volume. The inclusion of some of the aforementioned omissions and deletion of noncontributory photographs and case citations will greatly add to the value of the book to the general physician.

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MAXIMUM PERMISSIBLE BODY BURDENS AND MAXIMUM PERMISSIBLE CONCENTRATIONS OF RADIONUCLIDES IN AIR AND IN WATER FOR OCCUPATIONAL EXPOSURE: RECOMMENDATIONS OF THE NATIONAL COMMITTEE ON RADIATION PROTECTION. National Bureau of Standards Handbook 69. Price, $0.35. Pp. 95, with no illustrations. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Issued June 5, 1959.

The National Committee on Radiation Protection and Measurements (NCRP) is the present name of a national body which has developed criteria and made recommendations on ionizing radiation exposure since its formation in 1929. Subcommittee 2 of the NCRP is concerned with occupational radiation exposure from internal radioactive isotopes, and Handbook 69 is the latest manifestation of its deliberations. The document supersedes Handbook 52, which was issued in 1953, and includes more recent and much more extensive information.

The NCRP is an independent group of experts, and, although it is sponsored by the National Bureau of Standards (NBS), the recommendations are not those of the NBS. The NCRP Permissible Internal Dose Subcommittee has worked closely with the corresponding group of the International Commission on Radiological Protection (ICRP). Actually, the two groups have the same chairman. Handbook 69 is both the report of the NCRP subcommittee and an abridgment of the ICRP Internal Radiation report.

The recommendations of the NCRP are the most prominent and comprehensive in the country, and have been utilized in several ways. Although not law-making in themselves, they form the basis for radiation standards in the Atomic Energy Commission's regulatory program for both AEC prime contractors and AEC licensees (Part 20), the radiation control regulations of the military services, the radiation control legislation of several states, and the radiation control ordinances of some cities. Even in cases where no laws apply, the recommendations have been adopted by radiation users in their control programs.

The Federal Radiation Council was established by Public Law 86-373 in September, 1959, to ". . . advise the President with respect to radiation matters, directly or indirectly affecting health, including guidance for all Federal agencies in the formulation of radiation standards and in the establishment and execution of programs of cooperation with States." The Council was required by the law to consult the Chairman of the NCRP, and cannot help being influenced significantly by the past activities of the Committee.

Several pages of text in the beginning of Handbook 69 portray the history, composition, and functions of the NCRP, and explain the listed values, how they were derived, and how they should be applied. The bulk of the Handbook consists of Table 1, which lists over 200 radionuclides, with the maximum permissible body burden, maximum permissible concentration in air (MPC)a and maximum permissible concentration in water (MPC)w for each. The maximum permissible burden in the total body, q, is further divided into as many as 12 organs of reference, with corresponding air and water concentrations for each. The concentration figures are presented for both a 40-hour (working) week and for a 168-hour (continuous exposure) week.

For most isotopes, q is calculated on the basis of the amount of the particular nuclide in the body which would produce whole body or partial body radiation doses formulated by the NCRP as maximum permissible for external radiation. For bone-seeking elements, q is related to the maximum permissible body burden of 0.1 μg of radium-226 plus daughters.

The derivation of the concentration figures is fraught with even more calculation. Assumptions of intake, retention, body distribution, and excretion are used to develop the values which are based on the concentrations necessary to produce a maximum permissible radiation dose rate after 50 years of exposure. For most isotopes, equilibrium would be reached before 50 years, and the calculated body burden would be q. The assumptions are generally conservative, that is, exposure at the MPC level would result in low actual body burdens.

Any deficiencies in realism of the values in Handbook 69 can usually be attributed to limitations of biological data available for consideration by Subcommittee 2, rather than to any shortcoming in mathematical talent applied to them. The publications of the NCRP have often been misconstrued as the law of the land. They are not. The misunderstanding may result from the fact of federal agency sponsorship. For these and other reasons, NCRP recommendations have been the target of criticism. A careful review of Handbook 69 by these critics, however, should do much to relieve the objections:

> "The conclusions in the present handbooks are to be considered only as recommendations of a group of experts in the radiological protection field. They carry no legal implications demanding or requiring adoption.
>
> "Nor should the publication be construed as a recommendation by the National Bureau of Standards for adoption inasmuch as the important medical and biological factors involved in developing the recommendations are clearly outside of the Bureau's area of technical competence.
>
> "While the data used for these [MPC] estimates are believed to be the most reliable presently available, their use generally involves an extrapolation in time or in dosage level and they cannot be considered as definitive.
>
> "However, human data are very scarce and only in the case of radium does one have an accumulation of human experience for as long as 50 years, which is the minimum for selecting values for chronic exposure to man.
>
> "Because of the many assumptions and

approximations made in applying much of the data in this publication, *it is concluded that detailed refinements in the calculations generally are unwarranted.*

"Many other factors may have a large effect in determining the proper value for a maximum permissible limit. The relative abundance or scarcity in the diet of other non-radioactive nuclides with similar chemical properties, the wide range of physiological differences as well as differences in habits, age and sex, and the chemical form of the radionuclide or the size of the particle to which it is attached, may account for large changes in the value of the MPC in some cases."

Radiation hazards have been evaluated with far more calculation and extrapolation and less practical experience with effects on the employee than most other occupational hazards. There is so much tendency to be carried away by this mathematics, with calculations of ten to the minus something-or-other microcuries per cubic centimeter, that other factors, such as chemical toxicity, are sometimes lost sight of. Handbook 69, for example, recommends a maximum permissible body burden of 80 kg of neodymium-144 and more than 5 tons of indium-115. However, for all but about six such cases, the document is very useful and is a significant contribution to the field of health protection. Its presence will probably be felt widely as it manifests itself into standard operating procedures, regulations, and laws.

—THOMAS S. ELY, M.D., Acting Chief
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Office of Health and Safety
United States Atomic Energy Commission
Washington 25, D. C.

SELECTED MATERIALS ON EMPLOYEE RADIATION HAZARDS AND WORKMEN'S COMPENSATION. Joint Committee on Atomic Energy, Subcommittee on Research and Development. Price, not given. Pp. 327. United States Government Printing Office, Washington 25, D.C., 1959.

The selected materials covered the reports of some 40 expert witnesses who were to appear in March, 1959, before the Subcommittee of the Joint Committee on Atomic Energy, Congress of the United States, to report their views on this phase of the inquiry into atomic-radiation hazards. "The hearings were a continuation of the Joint Committee's inquiry into atomic radiation hazards begun in 1956." Other hearings of this Committee during 1959 have covered the subjects of industrial radioactive-waste disposal and Federal-State relationships.

There was almost universal agreement among the witnesses that the following needs should be met: (1) adequate uniform exposure standards throughout the United States; (2) more basic information on the effects of ionizing radiation in man and at what point exposure is noninjurious, if at all; (3) more persons to be trained in radiation-hazard control techniques; (4) adequate enforcement of radiation standards when they are adopted in codes or regulations; (5) centralized records of individual exposures; (6) greater public knowledge of radiation; (7) assistance to communities in planning for accidents in the handling of radioactive material; (8) compensation laws as comprehensive in covering radiation injuries as in covering other types of injuries, and guides to determine relationship between exposure and subsequent disability.

To satisfy these needs, some experts felt that federal legislation and control is necessary to ensure uniformity of treatment. They advocated a federal compensation law administered by the federal government. Other witnesses were convinced that the states could handle the significant problems, with a little federal assistance in outlining the problem and suggesting changes in their respective laws to take account of these problems. This is excellent source material for those interested in obtaining a cross section of opinions in this field from recognized leaders.

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Letters

TO THE EDITOR: The July, 1960, issue of the JOURNAL OF OCCUPATIONAL MEDICINE contains some inaccuracies with regard to the activities and location of the United States Army Environmental Health Laboratory. The following may be useful to you or your readers:

In Dr. T. G. Rigney's article, "Research in Occupational Medicine in the United States," this Laboratory is listed on page 328 as being engaged in "Administration and organization of occupational health services." Actually, research in administration and organization of occupational health services has not been a function of our organization for several years. On the other hand, the United States Army Environmental Health Laboratory is currently carrying on research in the following: (1) Dermatology, (2) Heat and Cold, (3) Illumination, (4) Noise and Hearing, (5) Radiation: detection and monitoring, (6) Radiation: physical effects, (7) Teaching: postgraduate education in occupational health, (8) Toxicology: basic, (9) Toxicology: clinical, and (10) Ventilation.

In Dr. Paul J. Whitaker's paper "Graduate Training in Occupational Medicine—The In-Plant Component," the United States Army Environmetal Health Laboratory is listed on page 328 as being located at Aberdeen Ordnance. The correct location is the Army Chemical Center, Md.

—ADAM J. RAPALSKI
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United States Army Medical Service
Army Chemical Center, Md.

Editorial

The World and Occupational Health

THE LAST week of July saw what was perhaps the most significant meeting of industrial health professionals held thus far. Certainly the XIIIth International Congress on Occupational Health staged in New York City was the most impressive industrial health convention ever witnessed in this country. It was attended by 1,434 registered members of the International Association on Occupational Health from 49 nations, accompanied by more than 300 wives. The Association which began in 1906 with an informal conference of specialists in Milan has met roughly every three years since that time save for interruptions during world wars. There has been a steady growth in the numbers attending and in the prestige of the meetings. The XIIIth Congress was the first to be held in the New World.

Those interested in administrative niceties will be intrigued by the vagaries of the International Association's structure and operations. The roots of the organization—its terms of reference—cling to nothing more substantial than an idea. A self-constituted group of colleagues, pursuing their respective ways in research and practice of industrial medicine, have provided the leadership for the triennial meetings and such business as might be required in the years between meetings. This group calls itself a Permanent Committee, and in 1957 the whole enterprise took on the flowing name of Permanent Committee and International Association on Occupational Health. In this nebulous hegemony the Permanent Committee comprises the chiefs and the members of the Association, the Indians.

At present 43 nations, located on all continents, have membership on the Permanent Committee. No scheme of membership has been devised that meets the dual requirement of democracy and reflection of industrial development. A working compromise permits each nation any number of delegates up to 18, the initiative for nomination residing with the national groups. Six countries have a full complement of Permanent Committeemen, the United States and five Western European countries. The inner operations of the Committee are the province of three officers (president, secretary-general, and treasurer) and six vice-presidents, all elected by the Permanent Committee and, perhaps unavoidably, called the Bureau. A typical triennial meeting tends to take on all the aspects of an autonomous operation, complete with its own officers, committees, and subcommittees. References to those with greatest responsibilities for the New York meeting appear elsewhere in this issue. Mention will be made here only of the product of the Program Committee under the chairmanship of Dr. Irving R. Tabershaw.

Besides opening and closing general sessions addressed by appropriately chosen dignitaries, there were 35 scientific sessions (usually five running simultaneously) at which 226 formal papers and several panel discussions were presented. All of these were identified and clearly located in a printed program provided each registrant in addition to a volume of abstracts of all papers in four different languages. This prodigious achievement is to be capped by publication of the complete proceedings, a historic volume which will be available for purchase in October.

The full implications of this great Congress will become clear only with the passage of several years. Comment at this time is cautiously restricted to a list of first impressions. Occupational health is shaping up as a multidisciplinary science whose central activity *for the time being* is industrial medicine. Toxicology and industrial hygiene engineering have been well established components for some time; and radiation safety, physiology, and psychology are moving rapidly to the center of the stage. The social mistakes that accompanied the industrial revolution in Western countries can in large measure be avoided because, on one hand, the very speed of change now requires active governmental participation and, on the other, there is increasing availability of well-trained occupational health specialists. As regards the latter, the United States holds no monopoly, perhaps not even a defensible claim to leadership; we have much to learn from our colleagues around the world.

Abstracts of Current Literature

Dermatology

Experimental Contact Dermatitis: Effect of Injections of 3-Pentadecylcatechol (3-PDC) and Mango Feeding on Cutaneous Sensitivity to 3-PDC in Guinea Pigs. H. L. Wechsler.* J. Invest. Dermat. 34:95 (Feb.) 1960. (Department of Dermatology, Western Pennsylvania Hospital, Pittsburgh, Pa.)

Immunologic procedures used in the prevention or treatment of poison ivy dermatitis are considered by some to be based on the same principles used in the treatment of the immediate-type allergy such as hay fever. A blocking-type mechanism has been postulated as following injections or ingestion of poison ivy extracts, and this may prevent subsequent reactions to the offending agent. To test this hypothesis, the following experiments were carried out.

In the first experiment, 16 guinea pigs were placed on a diet consisting of mangos and guinea pig scratch. Mango is a tropical fruit containing catechols similar to those found in poison ivy. After 55 days of this diet, the animals were topically painted with various concentrations of 3-pentadecylcatechol (3-PDC). All of the animals reacted to the eliciting strength of 3-PDC.

In the second experiment, six guinea pigs were used. These were given intramuscular injections of 3-PDC an alternate days for a total of three injections. Twenty-one days after the first injection, when challenged by topical painting, these animals reacted. Thus, it was concluded that these animals were sensitized by the intramuscular injections.

Both experiments were adequately controlled. It can be concluded that prior feeding of mangos or prior injections of 3-PDC did not provide immunity—rather such procedures actually induced skin sensitivity. —W.R.B.

Clinical Evaluation of Treponema Pallidum Immobilization Test Results. N. G. Rausch.* New York J. Med. 60:401 (Feb. 1) 1960. *333 Linwood Ave., Buffalo, N. Y.)

Arbitrarily, biologic false-positive reactions are divided into acute and chronic. The former may occur during or within six months after malaria, infectious hepatitis, infectious mononucleosis, tuberculosis, acute exanthemas, atypical pneumonia, immunization, upper respiratory infection, and, on occasion, with a normal pregnancy. Acute positive reactions of this type revert to negative within six-months' time.

Chronic biologic false-positive reactions are those persisting longer than six-months' time. They may be the presenting evidence of serious pathologic entities such as systemic lupus erythematosis, periarteritis nodosa, rheumatoid arthritis, rheumatic fever, and, on occasion, sarcoidosis.

The Reiter protein complement-fixation test is apparently suitable for mass screening. A recent study showed it to be entirely effective because it does not react with normal sera or with biologic false-positive reactions. This test should be used, in addition, to prove the diagnosis of syphilis. —W.R.B.

The Pathogenesis of Silica Granulomas in Man: A Non-Allergic Colloidal Phenomenon. W. B. Shelley* and H. Hurley. J. Invest. Dermat. 34:107 (Feb.) 1960. (*Department of Dermatology, University of Pennsylvania School of Medicine, Philadelphia.)

Silica, in noncolloidal state, failed to elicit a granulomatous response when injected intradermally into the skin of both white and negro healthy male volunteers. Contrawise, however, all three forms of colloidal silica in concentrations of 1:1000 or above always produced an epithelioid-granuloma response.

The authors' analysis of this reaction is that any large particle of silicious material undergoes changes over the years in the chemical action of the tissue fluids—hydration, ion exchange, oxidation, and subsequently release of colloidal silica. Once a threshold of colloidal siliac is attained, granuloma formation starts and continues over a period of time until all of the silica is ingested.

There is no evidence to support an allergic process for the development of siliac granulomas. —W.R.B.

Ecological Considerations on Nickel Dermatitis. P. V. Marcussen.* Brit. J. Indust. Med. 17:65 (Jan.) 1960. (*Department of Dermatology, The Finsen Institute, Copenhagen, Denmark.)

Nickel dermatitis was common in large industries until 1930. Marked hygienic improvements made by industry during the next 10 years caused a considerable subsidence in the incidence of nickel dermatitis. Over the past 20 years, there has again been a marked increase in sensitivity to the metal nickel from contact with articles in everyday use.

The present study points out that only 4% of the patients had nickel dermatitis from plating, some 9½% developed it from other industries, and in 86½% it was found to be caused by articles commonly used every day. In addition, in 14% of the patients with an occupational dermatitis from nickel, it was found that presensitization occurred in private life.

Because suspenders containing the metal nickel are an extremely common presensitizer, the author suggests they be replaced by nylon. —W.R.B.

Biochemical Experiments on the Binding of Chrome to Skin. F. E. Anderson.* Brit. J. Dermat. 72:149 (April) 1960. (*Skin Department, Royal Victoria Hospital and The Queen's University of Belfast, Ireland.)

Abstracts

Because certain clinical findings were observed with cement dermatitis, the authors designed biochemical studies to study these findings on a scientific basis. These observations may be summarized as follows: (1) Chromium compounds resulting from skin contact with dry cement appear to be less allergenic than those solutions encountered in wet cement. (2) The allergen appears to be the hexavalent rather than the trivalent chrome compounds. (3) The chronicity of cement dermatitis suggests that chromium may be permanently bound to the skin.

The experimental work demonstrated that there is an increased uptake by the skin from hexavalent chromium compounds at acid pH. With trivalent chrome compounds, pH made no difference. The mechanism of binding of trivalent chrome to skin appears to be different than that observed with hexavalent chrome. This difference may explain the difference in patch-test findings when using these chrome compounds.

Inconclusive results were obtained from experiments designed to find the site of binding of chromium in collagen. —W.R.B.

Medical Care Administration

Management Views Financing of Hospital and Medical Care. M. L. Denise. J. Indiana M. A. 52: 2038 (Nov.) 1959.

Management is interested in advancing the well-being of its employees and the communities in which it operates. It has an equal responsibility to consider the interest of the customers, stockholders, and the public at large. Our economic system relies on management to keep costs down, for it must keep the cost of doing business at a level that enables the business to grow and prosper.

The importance in considering the cost factor in developing policies in the medical-care area is emphasized by a look at what is happening to the cost of medical care. The rate of innovation in medical science and medical practice is rapid and promises to become even more rapid. As medical practice advances, the hospital must keep up with it. The rate of change and obsolescence in hospitals will be greatly accelerated in the next decade. We are faced with a rise in hospital admission rates, a rise in population, and a rise in costs.

Management knows that proper care in the event of an illness or accident can insure an earlier return to work and that the major share of illness or absenteeism is caused by off-the-job illness and accidents. With industrial processes becoming more complex, the absence of a few key people can be very costly. No one has come up with satisfactory price tags on these factors that would enable management to determine those cost expenditures for medical benefits which can be recouped. It is doubtful if the situation is such that reasonably precise calculations of this kind are possible. —A.B.

Price Behavior and Productivity in the Medical Market. J. W. Garbarino.* Indust. & Labor Relations Rev. 13:1 (Oct.) 1959. (*School of Business Administration, University of California, Berkeley, Calif.)

Over the last several years, medical care has contributed with depressing regularity to the Consumer Price Index of the Bureau of Labor Statistics. Between January, 1953, and June, 1958, the increase in medical-care price was more than twice the increase in the index as a whole. The view that health insurance is the critical factor in explaining the behavior of medical fees is not consistently supported, although no one would deny that health insurance has had an inflationary impact. In some cases, fees have undoubtedly been raised to exploit insurance, but, more important, health insurance has contributed to an increased demand in an already tight supply-demand situation.

The data on the supply of, and the demand for, physicians' services suggests that the most important cause for the observed fee behavior has been the pressure of a growing demand for more medical care on an inelastic supply of services. There is every evidence that within the next five years major changes in our medical economics are very likely to occur. More effort might profitably be devoted to anticipating the problems that such changes can be expected to present. —A.B.

A New Look at Preventive Medicine in American Industry. R. A. Kehoe.* J.A.M.A. 172:435 (Jan. 30) 1960. (*Kettering Laboratory, Department Preventive Medicine and Occupational Health, University of Cincinnati College of Medicine, Cincinnati, Ohio)

The practice of medicine in industry must be transformed from being concerned primarily with the diagnosis and therapy of occupational injury and disease into a productive function of disease prevention and health maintenance. This is the chief goal of industrial medical research.

Changes in the work environment and the working population are constantly taking place; so there is no hope of a permanent solution to the industrial medical problems. It is essential that every graduate in medicine and engineering have some grasp of the impact of technology in our society. There should be sound facilities for research and graduate instruction in these specialized fields in a large proportion of the university centers of education in medicine and sanitary engineering in this country.

Occupational medicine has gained recognition as a medical specialty by affiliation with the American Board of Preventive Medicine, thus acquiring new status. A proper share of the educational facilities and resources of the United States should be used for courses of instruction for physicians in industry and for carrying out productive

research. We should use this newly acquired status for establishing modes and forms of medical procedure in keeping with the needs of the people. —A.B.

Labor's Interests in Medical Care Plans. I. S. Falk.* Monthly Labor Rev. 83:145 (Feb.) 1960. (*Health Services, United Steelworkers of America, Pittsburgh, Pa.)

When organized labor saw little chance of getting comprehensive health insurance, it turned to group insurance through collective bargaining as its only practical alternative. Although proud of the insurance coverage achieved labor is dissatisfied with the gap in the insurance coverage, the steeply rising costs, and the uneven quality of care available to the insured.

According to Mr. Falk, management has been primarily interested in buying insurance on the easiest available basis, sometimes searching for the greatest uniformity of benefits, at the lowest possible price and the least involvement with organized medicine. He summarizes labor's health insurance goals as comprehensive medical care—preventive, diagnostic, therapeutic and rehabilitative—of high quality, with adequate continuing professional controls; well organized for availability, continuity, and economy in health service, preferably through group practice; fully covered by insurance, to the maximum extent practical; and service and insurance for active, laid-off, disabled, and retired employees and for their dependents. While working toward these long-range goals labor will seek improvements in the current insurance contracts. They believe that extensive improvement is needed and hope that management will be of the same opinion and that both will work together toward common objectives. —A.B.

To Each His Own—a State Occupational Health Program. L. M. Petrie.* Am. J. Pub. Health 59:1658 (Dec.) 1959. (*Georgia Department of Public Health, Atlanta, Ga.)

To each, his own responsibilities, and to each his own reward. It is estimated that not more than 10% of the people are under regular professional health supervision; the rest visit a physician professionally only for sickness or injury. The best answer is health education that teaches (1) inescapable responsibility of each individual for his own health; (2) limitation of his own resources; and (3) community resources available to help him. Similar basic lessons apply to organizations. The problem is to motivate them to be educated. In Georgia, it has been demonstrated that voluntary health tests will motivate 80 to 99% of the people to individual action for their own health's sake. The educational program is accomplished through three media: (1) Multiphasic health screening tests; (2) counseling in health problems; and (3) first aid and emergency service.

The benefits that accrue to management from a health working force are not only in terms of dollar saving but, more important, are in terms of better production, better morale, longer working life, etc.—factors whose dollar value is difficult to measure. State health departments cannot afford to overlook occupational health and its problems. —A.B.

Radiation Health

Nuclear Incident at the Idaho Chemical Processing Plant. W. L. Ginkel, C. W. Bills, A. O. Dodd, K. K. Kennedy, and F. H. Tingey. National Reactor Testing Station Report IDO-10035. (Available from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. Price, $2.25)

An inadvertent and somewhat unanticipated criticality accident occurred at the Idaho Chemical Processing Plant of the National Reactor Testing Station on Oct. 16, 1959. The event resulted when about 34 kg of enriched uranium in about 200 liters of solution moved from critically safe process storage banks to a geometrically unsafe tank. Although the tank was below grade and heavily shielded, the estimated 4×10^{19} fissions during a minute or so caused some gaseous and airborne contamination inside and outside the building. Radiation alarms sounded, and the 21 persons involved left the building.

Radiation exposures were shown to be primarily external. The individual with the highest exposure was estimated by film badge to have received 44 rem beta and 6 rem gamma. Lack of abnormal hematologic conditions indicates that exposure could not have been greatly higher. Much less internal exposure occurred. Urine assay revealed primarily Sr^{89} and Sr^{91}. The lack of neutron exposure was indicated by the failure to demonstrate Na^{24} in the blood. No symptoms related to the radiation exposure occurred. —T.S.E.

Metabolic Characteristics Within a Chemical Family. P. W. Durbin.* Health Physics 2:225 (Feb.) 1960. (*Lawrence Radiation Laboratory, Berkeley, Calif.)

A review was made of the data on the distribution and excretion of trace amounts of radionuclides of 70 elements given in a single intramuscular injection to rats. Results correlate with grouping in the periodic table. The anions, the oxygenated or halogenated ions of Groups IV, V, and VI, and the transition metals were rapidly eliminated in the urine. The bivalent cations, with some exceptions were deposited primarily in bone and were eliminated slowly. The lanthanide and actinide elements and the trivalent elements of Group III deposited primarily in liver and bone, and elimination was both biliary and renal. Quadrivalent cations, such as those of zirconium, thorium, and plutonium, were bound almost exclusively in bone. Biological behavior is determined

by the oxidation state stable at body pH, the solubility of this state, the incorporation into organic compounds, and the association with proteins. —T.S.E.

Neoplasia Following Therapeutic Irradiation for Benign Conditions in Childhood. E. L. Saenger,* F. N. Silverman, T. D. Sterling, and M. E. Turner. Radiology 74:889 (June) 1960. (*Radio-Isotope Laboratory, Cincinnati General Hospital, Cincinnati 29, Ohio)

Sixteen hundred forty-four persons who had received x-irradiation of the head, neck, and chest in infancy and childhood in the Cincinnati area were studied with respect to their subsequent medical history. Most of the treatments were given for "enlarged thymus" and cervical adenitis. A control group of 3,777 siblings was used. The survey was perfromed by personal interview in almost all cases.

Eleven cases of thyroid carcinoma were found in the patient group, which is about 100 times the morbidity table rate. None was found in the sibling controls. The results are not inconsistent with those of other surveys, and it is concluded that this type of irradiation is a contributing factor in the causation of thyroid cancer. —T.S.E.

Diagnosis of Radiation Injury and Analysis of the Human Lethal Dose of Radiation. E. P. Cronkite* and V. P. Bond. U. S. Armed Forces M. J. 11:249 (March) 1960. (*Medical Research Center, Brookhaven National Laboratory, Upton, N. Y.)

The symptoms of radiation injury are not unique, and its diagnosis may be extremely complex. On the other hand, when a characteristic symptom sequence follows the exposure to a known acute high dose of radiation, the diagnosis is extremely simple. Hematologic tests are one of the most useful devices for the detection and diagnosis of radiation injury. Determinations which have been used are those for bilobed lymphocytes, leukocytes, DNA-synthesizing cells in the peripheral blood, and mitotic index of the bone marrow.

The 50% lethal dose of radiation for human beings would be a very useful figure to have, not only for military offensive and defensive and civilian defensive planning, but also for human therapeutic radiation purposes. The current estimated 450 r has considerable uncertainty. Data which contribute to estimation of a human LD_{50} come from large animal studies, from the Japanses and Marshallese experiences, and from human therapy cases. Each has shortcomings. Analysis indicates that the LD_{50} should be lower than 450 r. —T.S.E.

Planning for a Radiation Accident. E. L. Saenger.* Am. Indust. Hyg. A. J. 20:482 (Dec.) 1959. *College of Medicine, University of Cincinnati, Cincinnati, Ohio.)

An emergency plan to minimize the effects of a radiation accident requires a coordinated response by management, medical personnel, and industrial hygienists (health physicists). The initial step in developing such a plan is to list all sources of radiation found at the installation and to determine the types of accidents which can be anticipated. The accident plan shall be prepared in detail assigning specific responsibilities to the above groups. The immediate accident plan shall include evacuation of personnel, first aid, proper notification, exclusion of the radiation area, survey for and confinement of contamination, and evaluation of exposures.

The most important problem created in a radiation accident is that of the exposed individual. The proper medical management of the patient depends on a clear understanding of radiation effects in humans. Serious thought shall also be given to the problem of publicity. —G.L.V.

Technics of Human-Bone-Marrow Procurement by Aspiration from Living Donors. R. E. Wilson.* New England J. Med. 261:781 (Oct. 15) 1959. (*Department of Surgery, Harvard Medical School, Boston.)

The acute radiation syndrome is one of various clinical situations in which bone-marrow infusions are valuable. The procurement of bone marrow is performed in an operating room with aseptic surgical technique. A general anesthetic is preferred to local anesthesia. The most satisfactory donor sites in the adult are the posterior ilium, sternum, and lumbar vertebral spines. For each 20- or 30-ml syringe, 4 ml of a suspension fluid (Hank's, Earle's, or T.C. 199 solutions) plus an anticoagulant are used. Persistent aspiration of the sternum through 12 to 15 punctures, using a 16-gauge Bierman needle, produces 50-70 ml of marrow and blood. Accurate positioning of a single puncture location in the posterior ilium on each side with a 14-gauge Vim-Silverman needle, which is advanced into 15 or 20 different positions, should produce a total of 50 to 150 ml of marrow and blood. If the marrow is to be infused directly without preservation, it is passed through a series of stainless-steel screens, placed in a single plastic transfer pack, and given to the recipients by the intravenous route. —G.L.V.

Radiological Hazards in Veterinary Practice. D. C. Trainor* and W. E. Foskett. Australian Veterinary J. (Jan.) 1960. (*Division of Occupational Health, Department of Public Health, New South Wales)

Occupational radiological hazards in veterinary practice are not so apparent as those in medical practice; consequently the opportunity for excessive exposure may be greater. Also, the veterinarian has unique problems in performing radiography. For positioning and holding his noncooperative subjects, he may use anesthesia, the owner, or himself. The first two choices have disadvantages; hence many practitioners hold the

animals, often without sufficient personal protection.

A survey was conducted in which 12 veterinary practices with 29 persons were examined. Although no gross blood abnormalities were seen, some suspicion-arousing skin changes were revealed. Other studies are cited in which more skin manifestations were seen, and it is concluded that these are the principal hazards involved. The exposures are evaluated, and recommendations for reducing them are presented. —T.S.E.

Surgery

Medullary Fixation of Fractures of the Forearm. F. P. Sage,* J. Bone & Joint Surg. 41-A: 1489 (Dec.) 1959. (*Memphis, Tenn.)

Initially the history of medullary fixation, particularly of the forearm bones, is briefly reviewed. It is pointed out that the unsatisfactory results were usually due to failure of the fixation device to immobilize bone fragments adequately to ensure union. It is stressed that closed reduction has been unsatisfactory, since this method of treatment represents a compromise in which malposition is accepted to ensure union. The author also points out that the use of plates and screws may result in a relatively high rate of nonunion because the insertion of a plate requires extensive dissection and periosteal stripping. The unsatisfactory results often encountered in intramedullary nailing of the forearm have been due primarily to lack of fixation of the radius in an anatomical position or failure to maintain that position. In order to preserve pronation and supination the normal arc of the radius as well as the rotational alignment of the diaphysis must be preserved. Failure to maintain this arc will lead to distraction of the fragments of a fracture of the ulna if this bone is also involved.

The author has developed a nail of appropriate shape and temper for intramedullary fixation of fractures of the radius. This nail was prebent and was made of metal sufficiently springy to bend as it traversed the canal from the point of insertion, but resilient enough to spring back to its prebent contour when finally seated. It was also designed so that when finally seated it was rigid enough to withstand the torsional, rotational, and angulatory forces exerted by the muscles of the forearm. One hundred twenty radii from dissected cadavers were studied to determine the proper curves and length of this nail. This analysis showed that the extent of cancellous bone in forearm fixation did not seem very important because a nail small enough to be accommodated by the radius has so small a surface area that little if any fixation can be obtained in cancellous bone. It was found that the nail could always be rotated easily in the cancellous bone and did not become fixed until it was firmly seated against cortical bone. A clinical trial using this prebent nail was carried out on 50 patients having 82 fractures of the forearm. The prebent medullary nails were used to fix all the fractures of the radius, whereas straight medullary nails were used to fix the fractures of the ulna.

An opinion as to the degree of stability afforded by the fixation at the time of operation was recorded by the surgeon in all cases. In fractures involving the radius alone, stability was described as good or excellent in 94.5% and as fair in 5.5% of cases. Nine per cent of the patients were immobilized for more than 6 months and the mean period of cast immobilization for the entire series was 12 weeks. Internal fixation was maintained until firm periosteal new bone was present. It was noted early in the series that, although periosteal callus appeared fairly early, there was a definite delay in complete obliteration of the fracture line. Even though the fracture was united by mature, bridging, periosteal new bone, it was often not until after the nail had been extracted that the interstitial bone formed and completely obliterated the fracture line. Grafts of chips of autogenous iliac bone were used to stimulate osteogenesis in one-sixth of the fractures involving the radius alone and in one-third of the fractures of the radius and one-third of the fractures of the ulna where both bones had been fractured.

The technique of insertion and extraction of the nails is described, and the indications given for their use in diaphyseal fractures. The author stresses that the technique is exacting and if not properly performed may produce complications. —J.T.A.

End Result Study of a Series of Operations for Herniated Intervertebral Lumbar Discs. F. S. Webster* and D. P. Smiley. Am. J. Surg. 99:27 (Jan.) 1960. (*Lincoln, Neb.)

An analysis is made of a series of 200 operations for herniated lumbar discs. The relative merits and results of surgery with and without bony stabilization are evaluated. Included in this series are only those patients who presented the acute symptoms and pathological findings of a definitely extruded disc and in whom operation resulted in the early subsidence of severe subjective complaints and objective findings. Fifty-four of the 200 patients had complete extrusion of the nuclear substance of the intervertebral disc. The follow-up period of the entire series ranged from 2 to 10 years. Each patient had a complete trial of conservative management without relief prior to surgery. Of the 200 patients in this series, 102 had simple excision of the herniated disc and in 80 disc excision and bone fusion were performed.

On a percentage basis, 65% of the patients with disc removal alone had good or excellent results and 80% with disc removal and fusion had good or excellent results. The authors state that the selection of one procedure over the other was determined by the future work requirements of the patient. Thus, the majority of patients who

had fusion in addition to disc excision were those doing heavy physical labor, mainly farming. Of the 120 patients having disc operations without fusion, 3 had fusion done subsequently because of continued complaints. At the time of original surgery, all 3 of these patients exhibited completely extruded nuclear material.

The appearance of narrowing of the disc space radiologically did not appear to be of direct diagnostic significance, for in several cases rupture of the disc occurred at the level above that of rather marked lumbosacral narrowing. Pseudarthrosis through the bone graft was radiologically demonstrated in seven patients in this series. This was approximately 9% of the 80 who had fusion. All of these pseudarthroses developed in two-level fusions.

The authors conclude that improvement with satisfactory results may be expected in all but a small percentage of patients operated upon with or without fusion if a lesion requiring surgery is correctly diagnosed. In their experience disc surgery with fusion generally gave superior long-term results in this series of 200 cases. —J.T.A.

Industrial Hygiene

Treatment of Exhaust Gases from Boron Fuels. W. H. Williamson* and M. F. Clay. Am. Indust. Hyg. A. J. 21:110 (April) 1960. (*General Electric Co., Evendale, Ohio.)

This paper brings out some important points concerning the removal of vapor and fine particulates from exhaust gases. The experiments compared two types of scrubber efficiencies with Fiberglas cloth filtration. While the cloth filter removed 99% of the boron oxide fumes from the exhaust gas, the scrubber efficiencies varied (73% —99.5%) with the type of scrubber and the inlet-gas temperature. A distinction is made between quench scrubbing and ordinary wet scrubbing, and tests were run to determine the optimum ratio of injection-water flow to water evaporated. Somewhere in the vicinity of 3:1 injection water over evaporated water seems to be the most efficient for removal of B_2O_3. "The introduction of a large number of coarse water droplets into the exhaust gas at its hottest point is a significant factor, since the same quantity of water added to the gases after they have been cooled is not nearly as effective. This may be explained by considering the water droplets as nuclei of condensation for the boron oxide which exists as a vapor in the hot exhaust gas. The boron oxide vapor condenses on the droplets which are large enough to resist complete evaporation in the hot gas steam. If, however, the gases are first cooled and boron oxide exists as minute solid or liquid particles, then these particles are removed only by the random contact of conventional scrubbing."

Comparison tests with ferric oxide, which presumably is not vaporized, show efficiency of removal of 0%—21%, pointing out the importance of chemical and physical state of the contaminant in the effectiveness of air scrubbers. —E.C.R.

Health Aspects of the Commercial Melting of Uranium-Contaminated Ferrous Metal Scrap. R. H. Starkey,* J. W. McKelvey, B. J. Held, and E. L. Alpaugh. Am. Indust. Hyg. A. J. 21:178 (April) 1960. (*National Lead Company of Ohio, Cincinnati, Ohio.)

This article indicates the value of the conventional industrial-hygiene sampling and evaluation techniques plus some radiation-control techniques which were worked out in pilot-plant and full-scale operations involving uranium exposures resulting from processing scrap metal. In this study, the air samples were evaluated in respect to the alpha count of the sample by the usual Atomic Energy Commission technique, and the urine samples were collected and evaluated for the uranium concentrations. Although the figures indicated that the average concentration in the crane area was above the maximum permissible concentration, respirators prevented inhalation of excessive amounts. Of seven crane operators who worked during this melting operation, four never showed urine results above 0.025 mg. of uranium per liter of sample. The three others had one sample each which was slightly above that concentration.

The information shows that large-scale smelting of uranium-contaminated steel can be carried out with no health hazard to the workers involved, if relatively simple industrial-hygiene controls are exercised. Adequate ventilation is a far more desirable means of controlling dust exposures than the use of respirators. Thus, for operations lasting for extended durations, an efficient exhaust system should be installed. Fume-type respirators offer adequate temporary protection, but their use is highly undesirable if a permanent-type operation is anticipated. Regardless of the method used for controlling the airborne contamination, a thorough air survey should be conducted to verify that the controls are adequate. —E.C.R.

Occupational Exposures as Etiologic Factors in Heart Disease—A Brief Review. L. J. Goldwater.* A.M.A. Arch. Indust. Health 21:509 (June) 1960. (*School of Public Health, Columbia University, New York, N.Y.)

The occupational environments which may cause pathological or functional cardiac changes fall primarily in the areas of biological contacts, physical forces, and chemical agents. A literature review indicates that only a limited number can be considered truly etiologic factors in heart disease. The review does not include trauma, physical exertion, or emotional stresses as they may be involved with the occupational environment. The physical agents that have been implicated in heart disease are abnormalities of air pressure and tem-

perature, and humidity, electricity, and ionizing radiation. Electric shock may produce cardiac arrhythmias which may vary from premature systoles to ventricular fibrillation.

Findings by Burch indicate that a hot, humid enviroment increases the work load on the heart so that subjects with diminished cardiac reserve may go into congestive failure and those already in failure may experience intensification of symptoms.

A review of von Oettingen's book, with special reference to the chapter dealing with toxic agents that may affect the circulatory apparatus, provides the basis for a tabular summary of the chemicals which are reported to act on the heart. However, this tabulated summary "does not necessarily mean that conclusive evidence exists that the respective materials can cause the reported abnormality."

Dusts capable of producing fibrotic changes in the lungs may induce pulmonary hypertension and thus be brought into etiologic relationship with cardiac problems. —L.W.S.

Industrial Hygiene Features of a Petro-Chemical Benzene Plant Design and Operation. J. W. Hammond* and E. R. Hermann. Am. Indust. Hyg. A. J. 21:173 (April) 1960. (*Humble Oil & Refining Company, Houston, Texas)

The physical and toxic properties of benzene are factors to be considered in the design, construction, and operation of a benzene manufacturing and storage facility. This article discusses the planning of an installation and the relevant medical and air data obtained during 18 months of operation.

Evaluation of the process and equipment made it possible to anticipate where vapor and liquid releases might occur. Control measures were built in at these points. Prevailing winds were studied in planning the layout in order to minimize the effect of possible vapor drifts. Flush cocks and sampling valves were located over waste drain openings, and leakage was collected in a sump and pumped to closed tanks for reclamation. Truck and rail car loading racks had sloped concrete drainage areas leading to sewer drains.

Preplacement and periodic physical examinations of employees were initiated. The industrial hygiene aspects of the operation were stressed to the operating personnel. Exposures of laboratory personnel doing quality control procedures were simulated by pilot studies to determine the probable degree of hazard, and methods to minimize the release of vapors during testing were developed.

Both indoor and outdoor air tests were made at least once a week during the first 10 weeks of operation. An MSA aromatic hydrocarbon detector and, occasionally, a model 21 Riken Interferometer were used. "Concentrations of aromatic hydrocarbon encountered in areas generally frequented by employees did not exceed 10 ppm and were generally less than 5 ppm under most climatic conditions." High concentrations in air due to leaks and spills were corrected for both economic and health reasons.

The urinary sulfate ratio as a control measure is also discussed. In effect, both air and human tests serve as a two-dimensional sampling program, since "the plant operating personnel, themselves, serve as integrating samplers for a bioassay technique." Findings indicating definite exposure in six instances were related to human factors, such as laxity in wearing proper respiratory equipment while cleaning up spilled benzene, working a double shift, or doubling the necessary sampling frequency because of an upset in the process. A biogram for 48 weeks of operation, including data on 16 employees, is given, indicating degrees of exposure. —M.K.

Noise and Hearing

Masked Thresholds for Octave Band Noise. J. L. Fozard,* W. E. Bacon, and A. M. Small, Jr. J. Acoust. Soc. America 31:1681 (Dec.) 1950. (*Department of Psychology, Lehigh University, Bethlehem, Pa.)

These authors present the first known data relative to the masking of a "narrow band" of noise by a "wide band" noise. The data define the threshold levels for two octave bands, 127-255 cps and 1020-2040 cps, in the presence of a wider band of noise, 50-9000 cps. The masking noise (50-9000 cps) was presented at sensation levels (SL) of 10, 20, and 50 db. Two groups of 26 young subjects were used. Thresholds for the discrimination of the octave-band noise in the presence of the wide-band noise were averaged for the subjects and expressed as signal to noise (S/N) ratios. Signal level was expressed in octave-band level and the noise levels as the over-all level for the total band. The S/N ratios were negative at all SL's for the 1020-2040 cps band and ranged from –3 db at an SL of 10 db to about –4.2 db at an SL of 50 db. The S/N ratios were positive at all SL's for the 127-255 cps band. At an SL of 10 db the 127-255-cps band had to be 6 db above the level of the noise to be detected. At an SL of 20 db for the noise the 127-255 cps band was only 2.5 db above the noise level when detected. At other noise sensation levels the S/N ratio decreased slowly for the 127-255 cps band but it never became negative. The sharp drop in S/N ratios between SL 10 db and SL 20 db is related principally to the absolute hearing threshold in this frequency region (127-255 cps). —H.O.P.

Temporary Threshold Shift in a Changing Noise Level. W. D. Ward,* A. Glorig, and W. Selters. J. Acoust. Soc. America 32:235 (Feb.) 1960. (*Research Center, Subcommittee on Noise, Los Angeles, Calif.)

These experiments are aimed toward defining the behavior of temporary threshold shift (TTS)

when exposure to a relatively high noise level is followed by exposure to a lower noise level but one that will produce some TTS by itself! Individuals were exposed to 1200-2500-cps octave-band noise. The exposures were (1) 30-minute exposure to 105-db sound-pressure level (SPL) followed by 180-minutes recovery in silence; (2) 30 minutes of noise at 105-db SPL followed by 180 minutes of exposure to 95-db SPL; and (3) 210 minutes of exposure to 95-db SPL. The threshold of hearing of each individual for 3000 and 4000 cps was tested at appropriate intervals. The 30-minute exposure to 105 db produced about 32-db TTS when tested two minutes after end of exposure. Recovery from TTS continued throughout the 180-minutes recovery period to about 13-db TTS on the last test (210 min). Exposure to 105 db for 30 minutes followed by 180 minutes of exposure to 95 db gave these results: At the end of 30 minutes (105 db) the TTS was about 32 db; as the exposure to 95 db took place the TTS first decreased then increased; about 20 minutes after the start of the 95-db exposure the TTS had decreased to about 27 db, or a decrease of 5 db; thereafter TTS increased through the rest of the 180-minute exposure, reaching a maximum of about 30 db. Under exposure for 210 minutes to 95 db, TTS increased steadily to about 27db. These data show that when exposure to high noise level is followed by exposure to a lower noise level TTS does not continue from the level produced by the high noise level, but first it decreases and then continues to increase at a new rate determined by the lower level noise. This complex process imposes great difficulties for those who would design and construct an "acoustic dosimeter." —H.O.P.

Latent and Residual Effects in Temporary Threshold Shift. W. D. Ward.* J. Acoust. Soc. America 32:135 (Jan.) 1960. (*Research Center, Subcommittee on Noise, Los Angeles, Calif.)

Some experimenters have suggested that exposure to a noise level that does not produce TTS (temporary threshold shift) may increase the TTS produced by a succeeding exposure to higher level noise or that recovery from TTS may be delayed by exposure to a non-TTS-producing noise level. A series of experiments were performed to test these propositions. Octave-band noise (1200-2400 cps) and broad-band noise (300-4800 cps) were used in the experiments. Exposure to both of these noises at levels which did not produce TTS (60 and 70 db for the 1200-2400-cps band and 78 db for the 300-4800-cps band) did not increase the TTS produced by a following TTS-producing exposure to the same frequency bands. Likewise, recovery from TTS produced by a 1-hr exposure to 100-db sound-pressure level (SPL), 1200-2400-cps band, was the same in "quiet" or in the presence of 70-db SPL in the same band. Therefore one may conclude that noise which does not itself produce TTS will have no effect on the growth or recovery of TTS produced by higher level noise exposures. —H.O.P.

Quieting Circular Saws. A. L. Cudworth.* Noise Control 6:26 (Jan.-Feb.) 1960. (*Liberty Mutual Insurance Company, Boston, Mass.)

The noise produced by the more commonly used circular-saw blades often can be reduced by eliminating play of bearings; removing shaft misalignment; substituting and using a different type of blade; installing stiffening collars; or applying damping rings. The principal causes of high-level-sound generation by circular saws are siren noise (chopping of air by the saw teeth) and resonant vibration (the excessive vibration of the saw rim when excited in one of its natural modes). Stiffening collars can be used—and in the example illustrated the 1200-2400 cps band level was reduced from 95 db to 75 db and the 2400-4800 cps band level from 103 db to 83 db. These two band levels were reduced to those comparable with the other frequency bands—and also to levels that are usually considered nondamaging to the ear. Vibration-damping tape may be applied in spots near the rim, or damping rings may be used. In one example, the use of such damping reduced idling noise in the 300-600, 600-1200, 1200-2400, and 2400-4800 cps bands and gave about 20 db of reduction in the 2400-4800 cps band. In another 14-inch carbide-tipped blade, the use of damping rings reduced the level of the 1200-2400 cps band about 10 db; the 2400-4800 cps band about 18-db; and the 4800-9600 cps band about 6 db. These significant noise reductions can be achieved by proper maintenance of saws and the appropriate application of damping materials or techniques. —H.O.P.

Field Measurement of Community Noise Exposure near Hanscom Air Force Base, Mass. A. C. Pietrasanta* and others. WADC Technical Note 58-163, Wright Air Development Center, (Aug.) 1958. (*Bolt, Beranek and Newman, Inc., Cambridge, Mass.)

Engineering procedures based on knowledge of average air-base operations have been developed to calculate the noise exposure due to these operations at any point around an air base. The purpose of this study was to make direct field measurements of the noise exposure at a particular location and to compare this measured noise exposure with the calculated value. The time pattern of noise for each aircraft "occurrence" (takeoff, flyover, ILS approach, landing, etc.) was recorded graphically for an eight-hour period for a given day.

The equivalent continuous sound-pressure level in the 300 to 600 cps band (L_{eq}) was determined for 61 measurable aircraft flyovers and was found to be 74 db. These data were compared with several calculated values which differed depending on whether assumed or actual flight paths, flight profiles, or activity data were used. Using assumed values for each of these three items, the

calculated L_{eq} was 79 db. For the observed flight path, flight profile, and aircraft activity, the calculated and measured L_{eq}'s are in good agreement. The manner in which the noise exposure was derived from the field measurements and the method for calculating the exposure are described in detail.

NOTE: This document may be obtained from the Office of Technical Services, Department of Commerce, Washington, D.C. —R.G.H.

Internal Medicine

Nerve Compression Due to a Tight Watch Band. H. R. Bierman.* New England J. Med. 261:237 (July 30) 1959. (*Hospital for Blood Diseases, City of Hope Medical Center Duarte, Calif.)

In an apparently normal healthy person complaining of persistent numbness of the thumb and index fingers, the possibility of a progressive neuritis due to a constricting watch band should be considered. The frequency of this condition is unknown but is probably greater than realized.

The author describes such a case in detail, and schematic sketches of the progressive hypesthesia are presented. In this case, about 130 days was required for improvement. The watch band impinged upon the superficial branches of the radial, median, and musculocutaneous nerves coursing over the distal radial head. The most frequently injured of the superficial nerves is the radial. Median nerve injury occurs commonly at or near the wrist. A hypertrophied carpal ligament compressing the median nerve may result in thenar neuritis or paralysis.

It is suggested that in patients with the above complaint, the wrist be examined with the watch removed. Deep impressions made by the watch band or strap are frequently found. —S.H.S.

Hyperuricemia: Relationship to Hypercholesteremia and Acute Myocardial Infarction. P. M. Kohn* and G. B. Prozan. J.A.M.A. 170:1909 (Aug. 15) 1959. (*2460 Fairmount Blvd., Cleveland Heights 6, Ohio)

Fifty consecutive patients with acute myocardial infarction were studied to determine the relationship between hyperuricemia and coronary artery disease as well as between these two entities and hypercholesteremia.

The results showed a difinite correlation between elevated cholesterol levels in the serum and coronary artery disease. In adition, it was found that elevated levels of serum uric acid occurred with about the same degree of frequency in patients with myocardial infarction as did hypercholesteremia. Of the 50 patients studied, 20 men and 6 women had serum uric acid levels above 6 mg %. Forty-three of the 50 patients showed a serum cholesterol level above 250 mg %.

The authors suggest that uric acid levels as well as serum cholesterol levels be estimated to assess the proneness of patients to coronary artery disease. —S.H.S.

Abstracts

Chemical Evidence of Incidence of Hypothyroidism: Study of Employed Men and Women, Physicians, and Professional Blood Donors. R. Lowrey and P. Starr. J.A.M.A. 171:2045 (Dec. 12) 1959.

Serum protein-bound iodine studies were done on 1,823 male industrial employees, on 2,182 male blood donors, and on 735 male physicians. In the first group, 4.94% showed values below 4.0μg%, in the second group 9.2% had values less than 4.0μg%, and in the group of physicians, 4.2% had values below the considered normal. The study indicates the possibility that about a million industrial workers are hypothyroid.

A surprising and interesting finding was that of 1,015 females tested, only 1.5% showed values below 4.0μg%. This suggests that, rather than 4.0μ% being considered the lower limit of normal in females, the values should be raised to 4.5μg%.

The authors conclude that men who have values below 4.0μg% should be given lifelong thyroid therapy so as to maintain a protein-bound iodine level between 5 and 6μg%. —S.H.S.

A Morbidity Study on a Working Population. G. A. Sinclair.* Canad. M. A. J. 82:407 (Feb. 20) 1960. (*56 Church St., Toronto 1, Ont., Canada)

As a means of developing a comprehensive quantitative assessment of employee health, the author has drawn on data accumulated by medical department of Imperial Oil, Ltd., Canada, to compute several statistical indices, each of which measures some aspect of morbidity in the employee population. The sources of data were (1) employee absenteeism due to sickness and accident and (2) medical examinations performed on applicants and employees.

One group of indices comprises sickness absence rates; the other, incidence and prevalence rates of abnormal conditions found on periodic health examinations. The incidence and prevalence rates provide information on health impairments that cause little or no absence from work. Thus, these two kinds of rates provide a more comprehensive picture of the status of employee health than either kind by itself.

The sickness absence rates were computed for the year 1957, when the average company population was 14,773. The rates were as follows: frequency rate (number of absences/average population), 1,268.3 per 1,000 employees; disability rate (calendar days lost/average population), 8.6 days; severity rate (calendar days lost/number of absences), 6.8 days; and, noneffective rate (frequency rate/365), 23.5 per 1,000 employees.

There was no lost time in 38.6% of the company population. One, two, or three absences during the year were incurred by 53.0% of the company population. This group accounted for 80.7% of calendar days lost. A small group of 8.4% of the employees absent four or more times were responsible for 19.3% of calendar days lost.

Abstracts

During the year 1957, there were 24,444 conditions or diseases noted in 9,878 periodic and preplacement health examinations. Twelve per cent of these conditions were newly discovered. Prevalence rates of certain diseases were as follows: malignant neoplasms, 0.6%; diabetes mellitus, 0.8%; gout, 0.36%; arteriosclerotic heart disease, 2.16%; hypertensive disease, 8.2%; ulcers of the stomach and duodenum, 3.15%; hernias, 2.8%; and rheumatoid arthritis, 0.3%.

Because of the reported high incidence of dermatitis in oil workers, a comparison was made of the incidence of this condition in refinery workers and in a control group. It was found that the incidence of dermatitis was essentially the same in the two groups, and similar to that in the general population.

During 1958, a study was made to determine the number of employees with limited work capacity. The proportion of workers in this category was 13.2%, but these employees were able to do productive work when placed at suitable jobs within their physical and mental capabilities.

The author concludes with a definition of employee health: "The state of well-being that exists when an employee is able and willing to fulfill regularly the requirements of his job."

—SIDNEY PELL, PH.D.

Steroid Therapy and Tuberculosis. H. Shubin,* R. E. Lambert, C. A. Heiken, A. Sokmensuer, and A. Glaskin. J.A.M.A. 170:1885 (Aug. 15) 1959. (*6601 N. 21st St., Philadelphia, Pa.)

The article points out that in using steroids in diseases such as lupus erythematosus, bronchial asthma, and others, pulmonary tuberculosis may be reactivated if these drugs are used improperly. Steroids used properly, however, have a very definite and important place in the treatment of certain tuberculosis problems. They are of infinite value in desensitizing patients allergic to drugs, they are useful in many patients with chronic resistant disease, they are useful in the treatment of acute sarcoidosis, and, finally, they may be lifesaving in some acute forms of tuberculosis. The judicious use of steroids is stressed. The minimum dosage for the shortest period of time required to obtain the desired effects will reduce complications. The authors urge physicians to investigate every patient for the presence of tuberculosis, prior to administering steroids, by skin tests and chest x-ray investigations. If doubt exists that tuberculosis is present and steroids are necessary, then the patient should have the advantage of simultaneous chemotherapy.

Case histories are presented showing recovery in patients with acute tuberculosis, and excellent results in the chronic form. There were 15 recoveries among 20 patients who were expected to die. Eight patients with tuberculous meningitis recovered.

—S.H.S.

Prognosis of Patients Surviving First Clinically Diagnosed Myocardial Infarction. J. L. Juergens.* J. E. Edwards, R. W. P. Achor, and H. B. Burchell. (*Section of Medicine, Mayo Foundation, Rochester, Minn.)

Follow-up observations were made on 224 survivors of an initial myocardial infarction. The survival rate for 3, 5, and 10 years was 68.8%, 55.4%, and 29.2% respectively. Survival rates were more favorable in younger age males. Preexisting angina, hypertension, or congestive heart failure had an adverse effect on survival. Ability to resume preinfarction activity was the best prognostic indicator. Physically strenuous activities did not influence survival rates. In 82% of the deaths, cardiac disease was the primary cause. Recurrent acute infarction was the commonest cause —L.W.

Clinical Toxicology

Parkinsonism Due to Manganese Poisoning. D. L. Overdoff* and F. Reinhold. M. Proc. 69:195 (May 7) 1960. (*Department of Medicine, University of Witwatersrand, Johannesburg, Union of South Africa)

This clinical report contributes 5 cases to the relatively numerous instances of chronic manganese poisoning published in the literature (427 cases). The patients whose cases are described (two colored, three white men), were workers in a factory that manufactured ferromanganese steel. The men were exposed to manganese fumes for periods of 6, 9, 13, and 24 months, respectively. Tiredness accompanied by sleepiness, dysarthria, a masklike face, muscular weakness, and spasticity were present in all of them; three of the men complained of aches deep in the limbs. The follow-up showed a rather static course in those workers who continued the exposure as well as in the patients who had been removed from the exposure. The authors state that both postencephalitic and arteriosclerotic parkinsonism were excluded from the differential diagnoses on the evidence of the presented symptomatology. An episode of acute respiratory illness, experienced by one of the patients, were interpreted as a chemical pneumonitis due to manganese fumes. No data are available in regard to environmental determinations.

—M.C.B.

Observations on the Use of Ca E.D.T.A. for Prophylaxis and Treatment of Manganese Chronic Intoxication. J. Ritter* and C. Marti Feced. Arch. mal. Profess. 21:115 (March) 1960. (*Service de l'Inspection Médicale du Ministère du Travail, Rabat, Morocco)

Workers of the manganese mines in South Morocco were studied in regard to therapeutic and prophylactic effect of edathamil calcium, (Na EDTA) The conclusions derived by the authors may be summarized as follows:

1. This chelating agent does not improve the clinical conditions of patients who are in a flourished toxic phase.

2. Edathamil calcium has a dramatic effect in patients with a recent onset of mild toxic manifestations.

3. The blood level of manganese decreased during edathamil treatment, although such decrease is variable and discontinuous.

4. A trial study on the prophylactic use of edathamil calcium indicates that it has a remarkable protective effect on exposed miners.

5. Daily doses of 3 gm of edathamil calcium intravenously are well tolerated, without evidence of untoward effects. —M.C.B.

Clinical Observations and Hepatic and Renal Function Tests in Workers Exposed to Tellurium and Selenium. G. del Carpio.* Salud ocup. 4:2 (April-June) 1959. (*Instituto de Salud Ocupacional, Lima, Peru)

This article compares findings from a study of workers from a selenium-tellurium refinery plant located in the high Peruvian Andes with those from unexposed workers living at the same altitude. Garlic breath, mouth dryness, and increased urinary elimination of tellurium and selenium were frequently present among exposed subjects. Serum bilirubin flocculation tests and prothrombin levels did not show any significant difference between the two groups. PSP excretion was slightly abnormal in a small percentage of the exposed subjects as well as the unexposed subjects, and a significant difference was not apparent. The author points out that in unexposed persons the level of tellurium elimination does not exceed 20 μg per liter of urine. On the other hand, the exposed worker with a urinary level up to 60 μg per liter may not show any signs of intoxication. The elimination of selenium in exposed persons may amount to 100 μg per liter of urine, and it may exceed 200 μg per liter if the exposure has been particularly severe. In unexposed persons the urinary elimination of selenium should not be far from zero. The author did not find selenium or tellurium in the urine of a control group of unexposed workers. —M.C.B.

Serum Proteins and Glycoproteins in Pulmonary Silicosis. L. Buscarini* and F. Nicrosini. Med. lavoro 50:368 (May) 1959. (*Instituto di Clinica Medica Generale e Terapia Medica dell' Università di Pavia, Italy)

Patients with pulmonary silicosis stage 1 (9 cases), stage 2 (5 cases), and stage 3 (15 cases) were examined for serum proteins and serum glycoproteins. The serum proteins were fractionated by paper electrophoresis, after total protein determination with biuret. Hyperproteinemia with hypergammaglobulinemia was noted in patients with silicosis of any degree, with more marked hyperproteinemia and α_2-globulinemia in patients with a stage 3 silicosis. The glycoproteins were determined in toto through the fractional analysis of glycoprotein exose, exosamine, and sialic acid. The paper electrophoresis separation and staining through a PAS reaction made possible the identification of the various glycoprotein fractions. Serum glycoproteins appear to be increased in proportion to the increased amount of total proteins in patients whose disease is classified as stage 1. In patients having silicosis stages 2 and 3, the increased glycoproteins of α_2-globulin fraction exceed the abnormal amount of the respective protein aliquot. These observations lead to the conclusion that glycoprotein fractionation, as an index of clinical phase of silicosis, has a greater value than the serum protein standard fractionation. The α_2-globulin fraction appears to possess the highest significance in this respect. —M.C.B.

Experimental Toxicology

"Imferon" and Cancer. A. Haddow.* Brit. Med. J. 1:1734 (June 4) 1960. (*Institute of Cancer Research, London)

The author reiterates his conclusion that the carcinogenic effect of Imferon (iron-dextran complex) is decided mainly by the absolute amount administered and only secondarily, if at all, by the relation of dose to body-weight. There was no evidence that oversaturation of the organism with Fe was necessary for sarcoma induction. Since repeated subcutaneous doses of 0.2-0.3 ml in mice produce a high yield of sarcomas, it cannot be said that a total dose of perhaps 60 ml in man would be harmless. More recent work has shown that repeated weekly subcutaneous injections of 0.05 ml of Imferon in mice induce sarcomas. Caution should probably be exercised in the use of iron injected subcutaneously, intramuscularly, or intravenously in man, since there are not enough data to compare the carcinogenic effects of Imferon with those of other absorbable iron compounds. —R.E.E.

The Pathohistological and Histochemical Changes in the Organs of Rabbits Subjected to a Prolonged Action of Carbon Monoxide, Sulfur Dioxide, and Their Mixtures. I. D. Prokhorov and A. A. Rozav. Gig. i sanit. 24:22 (June) 1959.

Rabbits were exposed for three months to carbon monoxide at 0.2 and 0.4 mg per liter to SO_2 to 0.2 mg per liter, and to mixtures of the two gases. Vascular disturbances, dystrophic lesions in internal organs, and a fall in succindehydrase (succinodehydrogenase?) activity followed SO_2 exposures. These changes were more pronounced after exposures to the mixtures. At a CO concentration of 0.2 mg per liter, succiondehydrogenase activity increased, which may have been a compensatory effect. —R.E.E.

The Metabolism of Phenolic Antioxidants' 2. The Metabolism of Butylated Hydroxyanisole in the Rat. B. D. Astill,* D. W. Fassett, and R. L. Roudabush. Biochem. J. 75:543, 1960. (*Eastman Kodak Co., Rochester, N. Y.)

Abstracts

Butylated hydroxyanisole is a mixture of 15% or less of 2-tert-butyl-4-hydroxyanisole (A) and 85% or more of 3-tert-butyl-4-hydroxyanisole (B). The main metabolites in rats are 4-O-conjugates, i.e. the O-sulfate and O-glucuronide of (A) and the O-glucuronide of (B); the latter, despite the steric hindrance involved in conjugation with the bulkier glucuronide as compared with the ethereal sulfate group. O-glucuronide formation becomes significant with (A) only when the sulfate pool is depleted by repeated large doses. Another probable but minor metabolic pathway is the O-demethylation of (A). The excretion of unconjugated BHA decreased from 7%-14% for a 10 mg/kg dose to 3%-7% for a 400 mg/kg dose. The low doses studied (as low as 2 mg/kg single dose and 500 mg/kg repeatedly) represent the closest thus far to the human usage dose (antioxidant in foods). There is no evidence to suggest that BHA is not largely absorbed and largely excreted at these low dosages. —R.E.E.

The Failure of Absorption of DC Silicone Fluid 703 from the Gastrointestinal Tract of Rats. J. Paul* and W. F. R. Pover. Brit. J. Indust. Med. 17:149 (April) 1960. (*University of Birmingham, England)

Very little if any absorption was observed in cannulated rats three and one-half hours after intubation with 0.65 ml of DC silicone fluid 703 in olive oil, nor did significant absorption occur in rats on an eight-day diet containing 16% olive oil and 4% DC silicone fluid 703. In the cannulated rats, 85% of the silicone was recovered from the gastrointestinal tract; the remainder is stated to be accounted for by experimental error. In the long-term studies, silicone recovery was 96%; this was found entirely in the low part of the gastrointestinal tract and feces. None was found in the liver, kidneys, or fat depots. The urine contained no soluble silica. —R.E.E.

Tumor Promotion by Citrus Oils: Tumors of the Skin and Urethral Orifice in Mice. F. J. C. Roe* and W. E. H. Peirce. J. Nat. Cancer Inst. 24:1389 (June) 1960. (*London Hospital Medical College, England)

Oils derived from the peel of orange, lemon, grapefruit, and lime all gave rise to papillomas in 5-12 weeks in tests for tumor-promoting activity by weekly application to the mouse skin after a single application of 300μg of 9,10-dimethyl-1,-2 benzanthracene. Several malignant skin tumors have also arisen. Orange oil, the only one tested alone, was not carcinogenic. Orange oil also promoted tumors in mice previously treated topically or parenterally with urethane. The promoting activity of orange oil is probably due to its content of *d*-limonene. Papillomatous tumors of the urethral orifice were seen in some mice treated with DMBA and diluted orange oil (but not the undiluted oil), with diluted orange oil only and with the non-terpene fraction of orange oil. These results are not clear-cut, but possibly acetone enhanced the absorption of the active component in orange oil and the tumors resulted from excretion in the urine of the component or its metabolite. —R.E.E.

Studies on Squamous Metaplasia in Rat Bladder: I. Effects of Hypovitaminosis A, Foreign Bodies, and Methylcholanthrene. P. Capurro,* A. Angrist, J. Black, and B. Moumgis. Cancer Res. 20:563 (May) 1960. (*Yeshiva University, New York, N.Y.)

Vitamin A deficiency was found to be a dominant factor in causing keratinization of rat bladder epithelium. It was singularly effective with an accompanying foreign body stimulus. Foreign bodies alone (paraffin pellets, 10% methylcholanthrene in paraffin pellets, and smooth and rough glass beads) did not stimulate keratinization, but hyperplasia of the epithelium was present. The degree of roughness in the latter cases appears to be a factor, and also a chemical factor may be operative in the paraffin pellet, since more atypical cytology was found with it than with glass. The cytologic distortion and metaplastic changes were more marked when methylcholanthrene was added to the paraffin. No instances of invasive carcinoma were seen. Experiments of longer duration (more than seven months) and a higher concentration of methylcholanthrene are indicated. —R.E.E.

Studies on Squamous Metaplasia in Rat Bladder: II. Effects of Estradiol and Estradiol plus Hexestrol. A. Angrist,* P. Capurro and B. Moumgis. Cancer Res. 20:568 (May) 1960. (*Yeshiva University, New York, N.Y.)

Estradiol increased the degree of metaplasia in the bladder of rats when combined with vitamin A deficiency and/or foreign body stimulation (wax pellets, 10% methylcholanthrene in wax pellets, and smooth or rough glass beads.) Hexestrol when added to estradiol did not enhance the effects of the latter.

The estrogens are apparently most effective on the epithelium of the bladder already altered by previous stimuli known to promote metaplasia, suggesting that squamous, rather than transitional, epithelium in the bladder is the more susceptible target tissue. —R.E.E.

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About the Authors

► DOUGLASS A. CAMPBELL, J.D., is a veteran referee of the California Accident Commission. Making due allowance for the blurring effect of distance and the well-known compulsion for the superlative that characterizes the locale, the editor is impressed by the regard in which Mr. Campbell is held by contestants on both sides of disputes in Workmen's Compensation. During his 36 years in this field, Mr Campbell's reputation for judicial integrity has been constantly high.

A native of California, Mr. Campbell received the B.A. degree from the University of California (Berkeley), and the M.S. degree in Public Administration followed by the J.D. from the University of Southern California. Two years later, in 1924, he became a Referee, a position he has filled continuously save for the short period, 1936-1939, when he served as Deputy Commissioner.

Mr. Campbell is the author of a two-volume book, "Workmen's Compensation, Its Insurance, Practice and Procedure," published in 1935 by Parker, Baird & Co., Los Angeles; and of "California Workmen's Compensation," a loose-leaf syllabus now in its second edition. He is a lecturer at the University of California (Los Angeles) and at the School of Law of the University of Southern California. He is the author of many articles in legal and medical journals, and a frequent speaker before various associations. He is a member of the State Bar of California and the American Bar Association. Mr. Campbell is the author of our lead article in this issue, "The Doctor's Role in Workmen's Compensation."

► HARVEY B. SNYDER, M.D., co-author of the article in this issue, "The Diabetic is Employable," is a staff physician on the Medical Division of the Humble Oil and Refining Company. Dr. Snyder received his academic education at Lebanon Valley College and his medical education at the University of Pennsylvania, graduating with an M.D. degree in 1944.

Thereafter, he served a rotating internship in the Reading Hospital, Reading, Pennsylvania. His postgraduate training included a residency in Pulmonary Tuberculosis at Belmont Hospital, Worcester, Mass., and a residency in internal medicine at Jefferson Davis Hospital, Houston, Texas.

Dr. Snyder is Clinical Assistant Professor of Medicine at the Baylor University College of Medicine and an internist in the Medical Division of Humble Oil and Refining Company. He is certified by the American Board of Internal Medicine and is a member of the Industrial Medical Association.

► S. A. LEVINSON, M.D., is author of the article in this issue, "Medicolegal Problems and the Impartial Witness." He is professor of pathology at the University of Illinois College of Medicine, Chicago, and consultant to the Research and Educational Hospital Laboratories of that institution. He was director of these laboratories from 1929 to 1955. During part of this period he was also professorial lecturer on forensic medicine at the University of Chicago.

Dr. Levinson received the M.D. degree from the University of Illinois in 1919 and later received the Ph.D. degree from Northwestern University. He is a diplomate of the American Board of Pathology and is certified in clinical pathology and forensic pathology. He is a fellow of the American College of Physicians and of the American College of Pathologists. He is a member of various specialty societies, such as American Association of Pathologists and Bacteriologists, American Society of Experimental Pathology, and the International Academy of Pathology. He is the author of numerous articles in the field of pathology and is co-author of the textbook, Clinical Laboratory Diagnosis (Lea & Febiger), now in its fifth edition.

► HENDRIK M. ROZENDAAL, M.D., is manager of the Biological Studies Section of the General Electric Research Laboratory and serves as liaison representative between the Laboratory and various groups working in biological research in the field of atomic energy. He is co-author of the article in this issue, "The Cancer Patient in Industry."

A native of Deventer, Holland, Dr. Rozendaal was graduated from the University of Leiden in 1928 with the degree of M.D. After two years of practice in Holland, he came to the United States in 1930 to join the staff of the Mayo Clinic at Rochester, Minn. In 1937 he went to Schenectady and set up a practice in internal medicine, which he continued until 1942, when he joined the Medical Corps of the U.S. Army. He attained the rank of lieutenant colonel. His medical section of the 33rd General Hospital saw service in North Africa and Italy. After VE Day, Dr. Rozendaal served as assistant to the chief public health officer in the American Zone of Germany.

Returning to Schenectady in 1945, Dr. Rozendaal resumed practice but relinquished it in 1947 for his new duties with G.E. He is a member of the American Medical Association and of the American Federation for Clinical Research, a diplomate of the American Board of Internal Medicine and a fellow of the American College of Physicians.

► BEVERLY L. VOSBURGH, M.D., is resident physician at the Knolls Atomic Power Laboratory and serves as medical consultant to the General Electric Company, especially in matters relating to pensions, executive health examinations, the issuance of industrial health bulletins, appraisals of medical service and the development of meetings for Company health personnel.

Dr. Vosburgh has devoted his entire medical career to occupational medicine at the General Electric Company. He graduated from the Albany Medical College, had postgraduate work at the Ellis Hospital, Schenectady, and then entered industrial medical practice in September, 1923. He became medical director at the large Schenectady plant in 1928, where he continued until 1951, when he took over medical consulting work for the company.

Dr. Vosburgh is a member of the county, state and national medical

societies, a fellow of IMA, a fellow of the American Academy of Occupational Medicine, American Broad of Occupational Medicine, American College of Preventive, Medicine and American Public Health Association. He is certified in occupational medicine by the American Board of Preventive Medicine. He is senior author of the article in this issue, "The Cancer Patient in Industry."

► EDWARD M. KLINE, M.D., is author of the article "An Appraisal of a Single Lead Electrocardiogram: A Report on 2,594 Electrocardiograms." The study is based on work done at Lamp Division, General Electric Company, Nela Park, Cleveland, where Dr. Kline has been consulting physician since 1949.

Dr. Kline received a B.S. degree from Washington and Jefferson College in 1930 and an M.D. degree from Western Reserve University in 1934. After an internship on Osler Medical Service at The Johns Hopkins Hospital, Baltimore, he entered a period of training and service at the University of Michigan. Here he successively was senior intern, instructor in medicine, and research assistant in cardiology. In 1940 he entered the private practice of internal medicine in Cleveland, Ohio.

Dr. Kline is certified in internal medicine and in cardiovascular diseases by the American Board of Internal Medicine. He is a Fellow of the American College of Physicians and of the Industrial Medical Association; he holds memberships in American Federation for Clinical Research, American Heart Association, and the Central Society for Clinical Research. His honorary societies are Sigma Xi and Alpha Omega Alpha.

► W. L. FAITH, Managing Director of the Air Pollution Foundation, was born in 1907 in Hancock, Maryland. He studied chemistry at the University of Maryland, graduating in 1928. At the University of Illinois he did graduate work in chemical engineering, receiving his M.S. degree in 1929 and his Ph.D. degree in 1932. In 1933 Dr. Faith became Assistant Professor of Chemical Engineering at Kansas State College. Later he became Professor and Head of the Department of Chemical Engineering.

Dr. Faith left Kansas State College in 1942 to join the War Production Board in Washington, D.C. Here he was first a consultant with the WPB's Office of Production Research and Development and later became its Deputy Director. In 1945 he became Director of Development Engineering with Corn Products Refining Company, Argo, Illinois. Subsequently he was made Director of Engineering of that company's chemical division.

In 1954 Dr. Faith was named vice president and chief engineer of the Air Pollution Foundation and became Managing Director in 1956. He is a member of the American Institute of Chemical Engineers American Chemical Society, Air Pollution Control Association, and American Academy of Sanitary Engineers.

Dr. Faith is the author of several books including "Industrial Chemicals, published in 1950, and Air Pollution Control, published in March, 1959. He is the author of "Air Pollution from Automobile Exhaust" in this issue. —EDITOR

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XIIIth International Congress on Occupational Health

July 25-29, 1960, New York City

Opening Plenary Session addressed by Leo J. Wade, M.D., President of the Congress and Chairman of the Organizing Committee.

THE Grand Ballroom of the Waldorf Astoria Hotel, New York was the scene of several sessions of the XIIIth International Congress on Occupational Health during the week of July 25, 1960. The room was provided with facilities for local broadcast of simultaneous translations into English, French, German, and Spanish languages which the listener could hear with a head-set.

The Congress is a triennial project of the Permanent Committee and International Association on Occupational Health, a voluntary, somewhat loosely organized group of specialists in occupational health, representing most of the industrialized nations of the world. Membership in this organization is based largely on interest, completion of an application form, and payment of annual dues. Each country is permitted 18 delegates to a legislative body, the Permanent Committee. In practice, the selection of delegates is from the top, by those already in positions of power. Real control of the International Association resides in three officers and six vice-presidents, constituting a Bureau, elected from the Permanent Committee. This group of intimately acquainted colleagues is sufficiently small to carry on the business of the International Association in the years that intervene between Congresses.

In keeping with good administrative practice, the creation and operation of a Congress are delegated to members in a host country. Leo J. Wade, M.D., President of the XIIIth Congress, developed a top organization from New York and the eastern U.S., facilitating communication and action during three years of intensive preparation. The Congress budget, in excess of $130,000.00, was largely underwritten by private industry, a fact of great interest to visitors from other countries who are accustomed to governmental direction of industrial health activities.

Left: Secretary-General of the Permanent Committee and International Association is Professor Enrico C. Vigliani of Milan. His key position in the organization is in keeping with the central part he plays in the industrial medicine of renascent Western Europe. He is Director of famed Clinica del Lavoro and the University of Milan's Institute of Occupational Health, and is a member of the Medical Research Committee of the European Community for Steel and Coal. A top clinician and investigator of occupational diseases, he and his associates make impressive research reports devoted to the technical aspects of occupational medicine at important meetings throughout the world. They presented three such reports at the Congress.

Right: Professor Sven P. M. Forssman, Sweden, was elected President of the Permanent Committee and International Association on Occupational Health for a third term. Originally an investigator in biochemistry and toxicology, Dr. Forssman moved into administration activities when at a comparatively early age he took over the direction of his government's interests in the occupational health problems of Sweden. In recent years he has been medical advisor to the Swedish Employers' Association. He makes extensive tours on special assignments in occupational health for the World Health Organization. He is Associate Professor of Occupational Health at Karolinska Institutet in Stockholm.

Fluent in English, German, and French in addition to his own language, mild mannered and a natural diplomat, hard-working Professor Forssman is without question the actual as well as the official leader of international occupational health today. At the sessions of the Permanent Committee he held the reins of control gently but firmly. At the same time he delegated complete authority for the Congress itself to the U.S. Organizing Committees.

Left: Three New Yorkers who carried great responsibility for the success of the Congress were Robert E. Eckardt, M.D., Sara P. Wagner, R.N., and Carl U. Dernehl, M.D,, shown left to right at the Congress registration center. Dr. Eckardt served as Secretary-General of the Congress and Chairman of its Budget Sub-Committee. Miss Wagner, a member of the Permanent Committee, served on the Executive Committee. Dr. Dernehl was Chairman, Arrangements Committee.

The impressive smoothness with which the complicated Congress operated was directly traceable to a beehive of activity at the Congress offices in the hotel. Here the able leaders of industrial health in the U.S. showed that they could work well together. Most of them brought in their own secretaries for the operation, knowledgeable ladies who had become familiar with the myriad details of the areas in which their bosses had worked hard for three years. An unknown figure in the cost of the Congress was time and work paid for industrial establishments and other organizations that employ all of these skilled persons.

Below: The United States delegation has a full quota of 18 members on the Permanent Committee and, in addition, two honorary members. Shown here, left to right, are: (seated) O. A. Sander, Carey P. McCord, Seward E. Miller (Delegation Chairman), Leonard Greenburg, Robert A. Kehoe, Hedwig S. Kuhn, and Heinrich Brieger, and (standing) Anthony J. Lanza (Honorary), Adolph G. Kammer, Royd R. Sayers (Honorary), Otis B. Schreuder, E. S. Jones, Leo J. Wade, Edward C. Holmblad, Anna M. Baetjer, James H. Sterner, Norbert J. Roberts, and Theodore F. Hatch. Missing are Sara P. Wagner and Robert E. Eckardt.

As an official body, the U.S. delegation was inconspicuous during the Congress except as they might have carried varying loads of responsibility as members of the Organizing Committees. The latter, comprised largely of industrial health professionals in New York and its environs, actually put on the Congress. In the formal sessions of the Permanent Committee the U.S. members, as became good hosts, listened to but rarely entered into the few minor disputes that arose. For the most part the business of these sessions comprised summary reports of the International Association, presented by its officers, the Bureau.

People and Events

► JOE D. BENTZ, M.D., and THOMAS A. SPEER, M.D., have been appointed full-time plant physicians at Homestead District Works of United States Steel Corporation, Homestead, Pa., it was recently announced by DANIEL C. BRAUN, M.D., Medical Director of the Homestead plant.

DR. BENTZ attended the University of Pittsburgh School of Pharmacy for two years and received pre-medical training at William and Mary College and Temple University. He served with the Army Medical Corps from 1942 to 1946, then returned to Temple University School of Medicine, receiving his medical degree in 1949. He interned at York Hospital in York, Pa., and spent the next two years with the Army of Occupation in Germany.

For the next five years, DR. BENTZ engaged in private and industrial practice in York, Pa., serving Sylvania Electric Products, Medusa Portland Cement Company and Dentists Supply Company. In 1958 he entered the University of Pittsburgh Graduate School of Public Health and recently received the degree of Master of Public Health. During his training, he was associated with the Pennsylvania Railroad in Pittsburgh, and served one year of in-plant training at the Westinghouse Atomic Energy Plant in Pittsburgh.

Joe D. Bentz, M.D.

Thomas A. Speer, M.D.

DR. SPEER graduated in 1955 from the University of Pittsburgh School of Medicine and served his internship at the McKeesport Hospital, McKeesport, Pa. He entered the U.S. Public Health Service in 1957, where he received specialized training in Civil Defense and dermatology, serving as medical consultant in Civil Defense to the State Health Department of Texas at Austin. Later he was medical officer-in-charge of a Public Health Service receiving center at El Centro, Calif. Prior to joining U.S. Steel, DR. SPEER engaged in the general practice of medicine with a part-time industrial affiliation as plant physician at the Trafford Works of Westinghouse Electric Corporation in Trafford, Pa.

► WALTER F. BALEIKO, M.D., has joined Standard Oil Company (Indiana) as staff physician in the general office medical department in Chicago. He was formerly with the medical department of the Crane Company, Chicago, for more than 13 years.

DR. BALEIKO received his M.D. degree from Loyola University School of Medicine in 1937 and served his internship at Cook County Hospital in Chicago, where

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he was later resident in internal medicine. During World War II, he was a Captain in the Medical Corps of the U.S. Army, serving as a transport surgeon and as commanding officer of a hospital ship platoon. After the war he was a clinical assistant in medicine at Illinois Research Hospital before joining the Crane Company.

► REX O. MCMORRIS, M.D., will join the Institute of Physical Medicine and Rehabilitation in Peoria, Ill., on September 1. He is presently head of the Department of Physical Medicine and Rehabilitation at Louisville (Ky.) General Hospital, and Associate Professor and Chairman of the Department of Physical Medicine and Rehabilitation at the University of Louisville.

DR. MCMORRIS received his M.D. degree from the University of Nebraska in 1949 and served a rotating internship at Bishop Clarkson Memorial Hospital in Omaha, Neb., and at the Mayo Foundation, Rochester, Minn. He earned the Master of Science degree in Physical Medicine and Rehabilitation from the University of Minnesota in 1954. He was certified by the American Board of Physical Medicine and Rehabilitation in 1955.

He is a member of the following organizations: Industrial Medical Association, American Academy of Physical Medicine and Rehabilitation, American Registry of Physical Therapists, National Rehabilitation Association, and the American Rheumatism Association.

► J. ALLEN YAGER, M.D., has been appointed Medical Director of Joseph E. Seagram & Sons, Inc., New York City. He leaves his practice of internal medicine to join Seagram where he will be in charge of the preventive medicine and health education programs of the company and its affiliates.

DR. YAGER graduated from the College of the City of New York in 1923 and received his medical degree in 1927 from New York University. In 1952 he obtained the degree of Master of Public Health from Columbia University School of Public Health and Administrative Medicine. Following his early medical training, DR. YAGER was a member of the teaching staff of

J. Allen Yager, M.D.

the New York University College of Medicine, completed a research fellowship at Bellevue Hospital, New York, and engaged in postgraduate studies in Vienna, Austria. During World War II, he served as a Lieut. Commander of the United States Navy Medical Corps for three years.

Currently, DR. YAGER is president of the Medical Board of Barnert Memorial Hospital in Paterson, N.J., and is a member of the Passaic County Air Pollution Control Association, the American Medical Association's Cardiology Committee on Medical Rating of Physical Impairment, and the Board of Directors of Group Health Insurance, a non-profit medical service agency.

► Actions taken at the annual meeting of the American Board of Preventive Medicine held in Philadelphia June 7 and 8, 1960, included the election of two new trustees for occupational medicine. LEMUEL C. MCGEE, M.D., Medical Director, Hercules Powder Company, and FRANK PRINCI, M.D., Associate Director of the Kettering Laboratory and Professor of Industrial Medicine, University of Cincinnati, will fill the places created by the resignations of ADOLPH G. KAMMER, M.D., and ROBERT A. KEHOE, M.D.

When the former American Board of Preventive Medicine and Public Health was converted to the present American Board of Preventive Med-

PRELIMINARY ANNOUNCEMENT

Post-Conference Tour to Hawaii

Following the Industrial Health Conference April 11, 12, 13, 1961, in Los Angeles, there will be an official IHC tour to Honolulu and some of the Hawaiian Islands. The basic tour will be 10 days, air travel each way—or 15 days, go by air, return by ship—with optional additional arrangements. An experienced travel organization has been appointed as our official tour representative, and we are now discussing details with them and our component society, the Hawaii Association of Plantation Physicians. An official tour brochure will be prepared for distribution later. In the meantime, it would be helpful if any who may be interested in the trip would complete and return the coupon below. There is no obligation, of course.

To: Clark Bridges, Managing Director
Industrial Health Conference
28 East Jackson Boulevard
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icine, provision was made for a set of officers and nine trustees, three representing each of the specialties of public health, aviation medicine, and occupational medicine. Occupational medicine's three trustees were JAMES H. STERNER, M.D., and DRS. KAMMER and KEHOE with DR. KEHOE serving as Vice-Chairman for Occupational Medicine. He and DR. KAMMER resigned after five years of service owing to the pressure of other work. DR. STERNER continues as a trustee and as Vice-Chairman for Occupational Medicine. The Board has a number of consultants representing official health agencies and certain professional associations.

An important consideration at the June meeting was the provision of a fourth component of the Board, designated as Preventive Medicine, Unspecified. This change has for some time been advocated by the American Board of Preventive Medicine to make eligible the specialists who do not qualify under one of the existing divisions. Notable in this group are the faculties of preventive medicine in the schools of medicine, epidemiologists, and certain health administrators.

The full roster of the present Board is as follows: *Officers*—ERNEST L. STEBBINS, M.D., Chairman; WALTER L. BIERRING, M.D., Chairman Emeritus; V. A. VAN VOLKENBURGH, M.D., Vice-Chairman for Public Health; WILLIAM J. KENNARD, M.D., Vice-Chairman for Aviation Medicine; JAMES H. STERNER, M.D., Vice-Chairman for Occupational Medicine; TOM F. WHAYNE, M.D., Secretary-Treasurer. *Members for Public Health*—CHARLES F. SUTTON, M.D.; RICHARD F. BOYD, M.D.; and J. H. BAILLIE, M.D. *Members for Aviation Medicine*—HAROLD V. ELLINGSON, M.D., and MERRILL H. GOODWIN, M.D. *Members for Occupational Medicine*—LEMUEL C. MCGEE, M.D., and FRANK PRINCI, M.D.

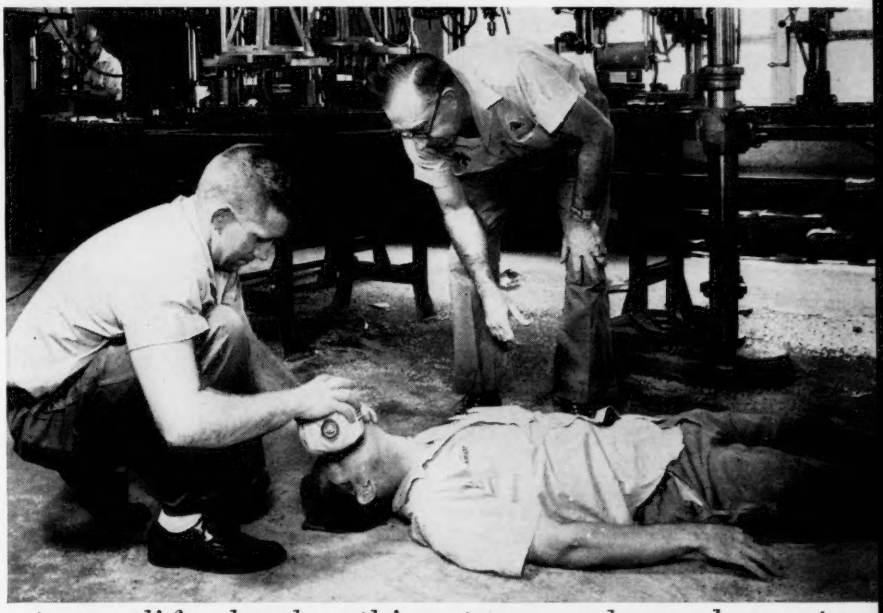
Consultants include R. C. ARNOLD, M.D.; ARTHUR LESSER, M.D.; E. GURNEY CLARK, M.D.; LIEUT. COL. LEE B. GRANT (MC) USAF; COL. ARTHUR P. LONG (MC) U.S. Army; JOHN J. PHAIR, M.D.; COMDR. JACK W. MILLAR (MC) USN; CHARLES E. SMITH, M.D.

EUSTACE W. TOMILINSON is Counsel to the Board.

► New York State Society of Industrial Medicine, Inc., will hold a joint meeting with industrial hygienists and industrial nurses on September 28 at the New York University Club in New York City.

A symposium on "Human Factors and the Work Environment" will feature three presentations as follows: "The Impact of Isolation on Personnel,"—BENJAMIN B. WEYBREW, PH.D., Head, Psychological Research Branch, U.S. Naval Medical Research Laboratory, U.S. Naval Submarine Base, New London, Conn.; "Some Operational, Emotional and Legal Problems in the Application of Maximum Permissible Radiation Doses,"—WILLIAM HARRIS, Director, Division of Environmental Sciences of the Health and Safety Laboratory, U.S. Atomic Energy Commission; and "The Office Environment: Fact and Fancy,"—ROBERT K. GAD, JR., Director, Office Planning Division, Shaw Walker Company.

► Western Ohio Industrial Medical Association will hold its first an-



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nual meeting September 14 at the National Cash Register Co., Dayton.

J. L. HARRIS, M.D., President of Western Ohio IMA and Medical Director, Armco Steel Corp., will introduce H. W. LAWRENCE, M.D., Medical Director, Procter & Gamble, who will speak on "Industrial Medicine in Western Ohio." The medical staff of the Air Research and Development Center, Wright-Patterson Air Force Base, will present a scientific program on the subject of "Space Medicine."

► The Fourth Annual Western Industrial Health Conference will be held October 7, 8 and 9 at the Jack Tar Hotel in San Francisco. The following presentations will comprise the scientific program:

"Evaluation of the Whole Man"—J. S. FELTON, M.D., Professor of Occupational Health, University of California, Los Angeles; "Fundamentals of Human Behavior"—panel discussion including JOHN ZUCKERMAN, PH.D., Personnel Director, Ampex Corp., EDNA MAE KLUTAS, R.N., Associate Professor of Occupational Health Nursing, University of Washington, and CHRISTOPHER LEGGO, M.D., Medical Officer, California State Personnel Board; "Chronic CO Intoxication"—JOHN GOLDSMITH, M.D., Head of Medical Studies, Air Pollution Program, California Department of Public Health; "Evaluating Low Level Industrial CO Exposures"—W. G. HAZARD, Chief Industrial Hygienist, Owens-Illinois Glass Co.; "Recent Industrial Hygiene Experience with New Plastics"—HERBERT T. WALWORTH, Chief Industrial Hygienist, Lumbermens Mutual Casualty Co.; "Propellant Fuels"—EARL A. WEILMUENSTER, PH.D., Manager, Propellant Development, United Technology Corp.; "Union Interest in Occupational Health"—E. RICHARD WEINERMAN, M.D., Medical Consultant for West Coast Union Health and Welfare Programs; "Rehabilitation—The Advantages and Adversities"—GREGORY BARD, M.D., Assistant Professor of Physical Medicine, University of California School of Medicine; "Practitical Approach to Tetanus Prophylaxis"—C. ALLEN WALL, M.D.; "What's Happening in California in Radiation"—Occupational Health Unit, California Division of Industrial Safety; "The Industrial Back—Are We Diagnosing It Correctly?"—panel discussion including DONALD W. BLANCHE, M.D., JOHN C. WILSON, M.D., and GEORGE H. PATTERSON, M.D.

Dr. George E. Armstrong presenting the New York University Presidential Citation to Dr. Anthony J. Lanza. Looking on are (left to right) Dr. David H. Goldstein, Mrs. Lanza, Dr. Norton Nelson and Mrs. Nelson.

► ANTHONY J. LANZA, M.D., Professor Emeritus of Industrial Medicine, New York University Medical Center, has been presented the University's Presidential Citation for his leadership in the field of industrial medicine and his service to the University. Three hundred of DR. LANZA'S colleagues attended a reception in his honor on July 27 at which the presentation was made by Dr. George E. Armstrong, NYU Vice-President for Medical Affairs.

In commending DR. LANZA, DR. NORTON NELSON, chairman of the Center's Department of Industrial Medicine, recounted the highlights of DR. LANZA'S career since receiving his M.D. degree from George Washington University in 1906. DR. NELSON said, in part:

"In his early assignment while serving with the U.S. Public Health Service, DR. LANZA was a leader in the organization of the federal program in occupational health; in this period he established ten branches of the Office of Industrial Hygiene . . . In 1921 the International Health Board of the Rockefeller Foundation sent DR. LANZA to Australia, where he inaugurated the Division of Industrial Hygiene in the Federal Health Department of the Commonwealth Government, and served as adviser until 1924. From 1926 to 1947 he was assistant, and then Associate Medical Director of the Metropolitan Life Insurance Company . . . At the beginning of World War II he accepted an appointment as a Colonel in the Medical Corps and organized the wartime program in occupational health in the army . . . In 1949 the Department of Industrial Medicine (NYU Medical Center) was established and DR. LANZA became its first chairman . . . Behind this bare recital of dates, titles and geography are those qualities that help make the man those around him have known: the warm understanding, the unfailingly perceptive intellect, the unassailable integrity and, most of all, the calm and steady wisdom. For his abundant and generous gift of these qualities to the University and for the many tangible achievements which have been their fruit, I, as spokesman for the faculty of Industrial Medicine, commend for the Presidential Citation of New York University,

DR. ANTHONY J. LANZA."

► Rocky Mountain Academy of Industrial Medicine will hold its fall meeting September 13 in the Intern Quarters at St. Joseph's Hospital, Denver, Colo. The program will consist of a panel discussion on "Problems Inherent in a Partially Integrated Industrial Medical Program." Panel members will be MARGARET BATES, Attorney-at-Law; J. D. SCHROEDER, Personnel Director, Gardner-Denver Co., and ROBERT F. BELL, M.D., Head of the Division of Industrial Medicine of the University of Colorado Medical School.